Service Manual

Document Scanner

SCAMAX® *2600/4000*

As at 04.06.2002 (SB)

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1 INTRODUCTION

The SCAMAX 2600 is a bitonal document scanner. It is designed to be used in document conversion projects of medium volume requiring medium speed. The scanner is driven from a PC connected to it. This PC also receives the scanned images and processes them further as required.

The SCAMAX 4000 is a colour document scanner. It is identical in construction to the SCAMAX 2600 , except that it is equipped with a colour camera.

1.1 Scanner Models, Options and Accessories

The scanners are currently available in the following Models:

Description	Part Number
SCAMAX 2600 Simplex Video, B/W with one scan unit for single sided scanning and video interface	s2600010
SCAMAX 2600 Duplex Video, B/W with two scan units for double sided scanning and video interface	s2600020
SCAMAX 2600 Simplex SCSI, B/W with one scan unit for single sided scanning and SCSI interface	s2600030
SCAMAX 2600 Duplex SCSI, B/W with two scan units for double sided scanning and SCSI interface	s2600040
SCAMAX 4000 Simplex Video, Colour with one scan unit for single sided scanning and video interface	s4000010
SCAMAX 2600 Duplex Video, Colour with two scan units for double sided scanning and video interface	s4000020
Options:	
Greyscale interface (SCAMAX 2600 only) 8 Bit; 256 Greyscales	s0000055
DTplus-Board (SCAMAX 2600 only) To scan difficult, low contrast documents	s0000500/1
Endorser Prints text, numbers or dates on backside of documents	s2600200
Acid resistant paper rollers For self-carbonising (impregnated) paper	s2500130
Accessories:	
Purpose built work desk	s0000055
Optical Filter #60 green (SCAMAX 2600 only)	s9000030
Optical Filter #40 red/orange (SCAMAX 2600 only)	s9000021
Optical Filter #90 red (SCAMAX 2600 only)	s9000020
Optical Filter #81 blue (SCAMAX 2600 only)	s9000010
Feeder extension for A3 documents	s2500122
Foot Switch (Paper separation On/Off)	s9000100
Anti-Static Brush for output hopper	s2500125
SCSI-Cable (50 Pin) high density	s9020100
SCSI-Cable (68 Pin) high density	s9020110
White Calibration Paper (10 sheets)	s9100000
Cleaning Kit	s9100010
Vacuum Cleaner	s9100020

1.2 Technical Data

- Scanner type: CCD array camera

- Number of scan units:
- 1 scan unit for single sided scanning
- 2 scan units for simultaneous scanning of front and back page

- Resolutions: 200, 240 (SCAMAX2600 only), 300 and 400 dpi

- Document widths: 26 mm - 320 mm

- Document lengths: from 60 mm upward

- Document thickness: various, can be set for each stack or single sheet

- Document feed: automatic from stack or single sheet hand feed

- Stack height: max. 50 mm

- Double Feed Detection: document length check and ultrasound sensor

- Video Port out to PC: V24, video digital, bitonal
optional: video with 256 greyscales (8 bit greyscale)
with
- Control Port to PC: serial, 9 pin, RS232
or:

- SCSI 2 Port to PC: 50 pin, high density
with
- serial interface to service PC

- Binarisation method:

- Standard unit	1. with fixed threshold and 2. with one-dimensional auto-threshold
- with Dtplus board:	with two-dimensional auto-threshold

- **Scan speed (at 200 dpi resolution):**
  - A4 portrait:
    - 75 sheets per minute (simplex)
    150 pages per minute (duplex)
  - A4 landscape:
    - 90 sheets per minute (simplex)
    180 pages per minute (duplex)

- **Electrical requirements:**
  230 V, 50 Hz, 1,0 A
  115 V, 60 Hz, 2,0 A

- **Dimensions (width, height, depth):**
  510 mm, 365 mm, 650 mm

- **Weight: 39 kg**

- **Endorser:** the optionally fitted endorser facilitates printing of free-dorm text, date, time and sequence number on the back of documents

- **Environmental requirements:**
  - room temperature: 10° to 35°C.
  - relative humidity: 30% to 80% without condensation

- **Noise level:** less than 70 dB

1.3 Compliance with Regulations and Standards:

The scanners Scanner SCAMAX 2600/4000 comply with the regulations and standards that form the basis of the CE compliance declaration that follows:

EG-Konformitätserklärung

Der Unterzeichner, der den nachstehenden Hersteller vertritt

Hersteller:	InoTec GmbH Organisationssysteme
Anschrift:	Biedrichstraße 11 D - 61200 Wölfersheim

erklärt hiermit, dass das Produkt und alle Produktoptionen

Produktname:	SCAMAX® 2600/4000

in Übereinstimmung ist mit den Bestimmungen der nachstehenden EG-Richtlinien (einschließlich aller zutreffenden Änderungen)

Niederspannungsrichtlinie:	73/23/EG
Maschinenrichtlinie:	98/37/EG
EMV-Richtlinie:	89/336/EG

Folgende Normen wurden erfüllt:

Sicherheit:	EN 60950:1992 + A1:1993 + A2:1993 + A3:1995 + A4:1997 + A11:1997 EN 292-2:1991 + A1:1995 EN 294:1992 EN 27779:1991
EMV:	EN 55022:1994 Klasse B EN 50082-1

Entsprechend dieser Richtlinien kann das Produkt mit der CE-Kennzeichnung versehen werden.

Wölfersheim, 13. April 2000

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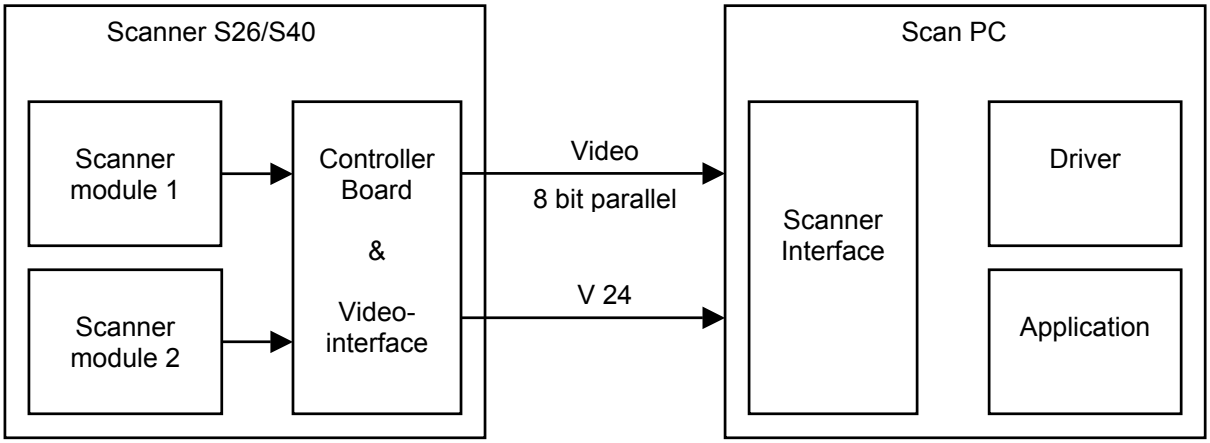
Jürgen Kaus
Geschäftsführer

2 SYSTEM COMPONENTS

2.1 SCAMAX 2600 with video interface

Documents are illuminated and scanned inside the SCAMAX 2600. The picture information is digitised and then sent to the external PC as an 8-bit parallel bitonal video signal for each side (front and back respectively) via the video interface. Compression, image manipulation and storage 9in TIFF-G4 format takes place in the PC.



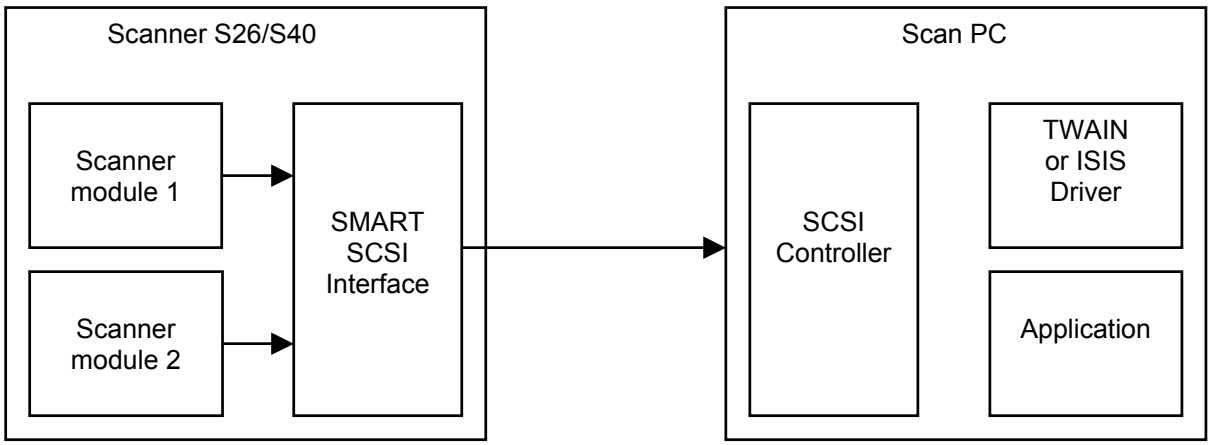
Scan module 1 is used to scan the front of each document.
Scan module 2 (present in the duplex scanner model) is used to scan the back of each document.
For difficult documents, like handwriting or coloured paper with low contrast, a DTplus board can be installed for each scan module. This enhances image quality greatly.
Image information is transmitted digital bitonal (black&white) from the scanner's video interface to the video board (f. ex. HISCAN or dunord board) in the scan PC. A separate control cable for communication purposes is fitted.

The PC's scan controls the video board via appropriate drivers, which in turn controls the scanner.

2.2 SCAMAX 2600 with SCSI interface

In a SCAMAX 2600 with SCSI interface the bitonal image data and all commands are transmitted via a SCSI cable.

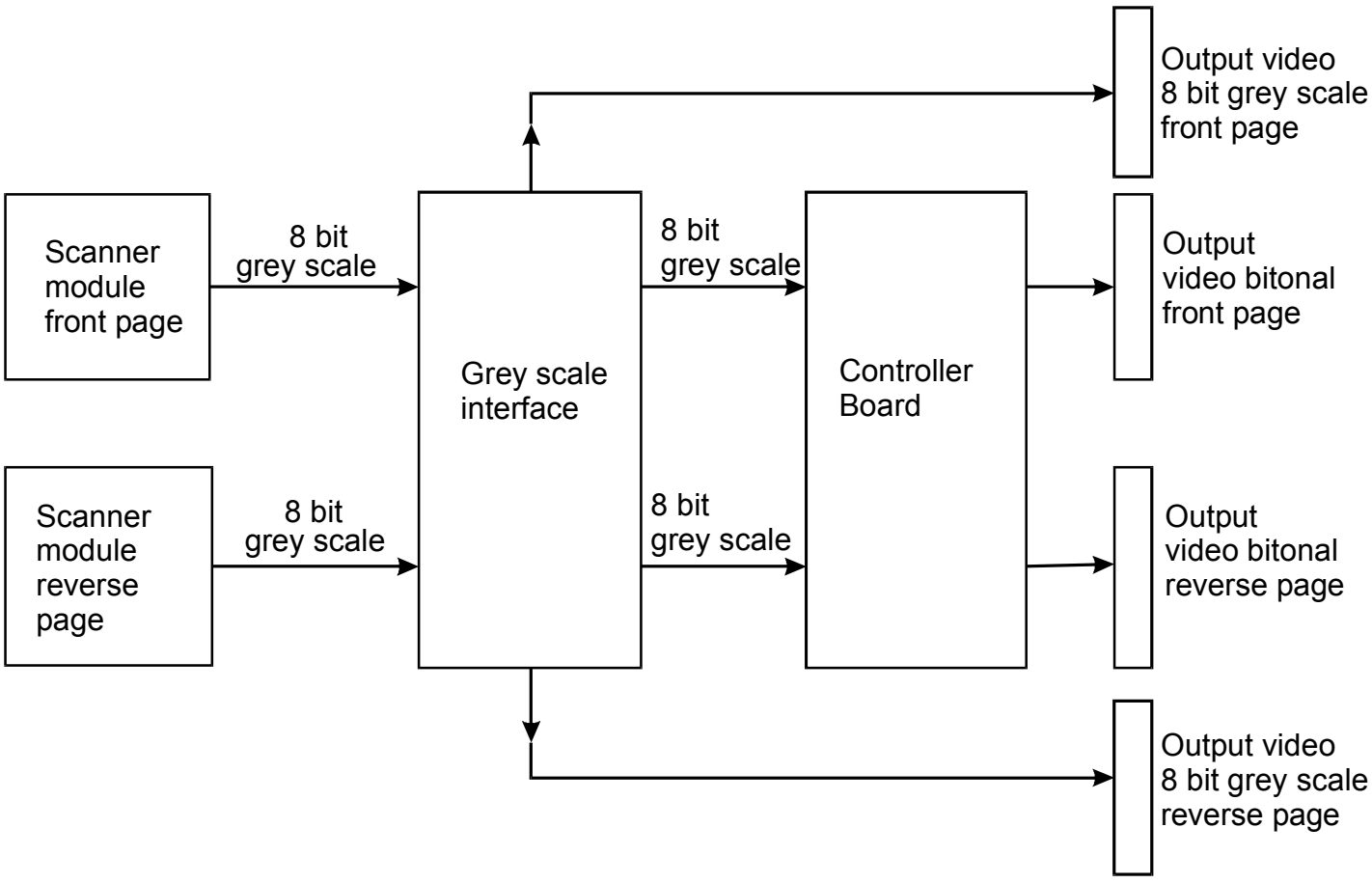
The scan PC must be fitted with a SCSI controller (f.ex. ADAPTEC 2940 AU). The scan application (client) controls the scanner via the Twain or ISIS driver supplied.



It is possible to control the SCAMAX 2600 via SCSI commands without using the Twain or ISIS driver. Since the command set of the SCSI interface is by and large compatible with other manufacturers it is relatively easy to generate a generic driver without great programming effort.

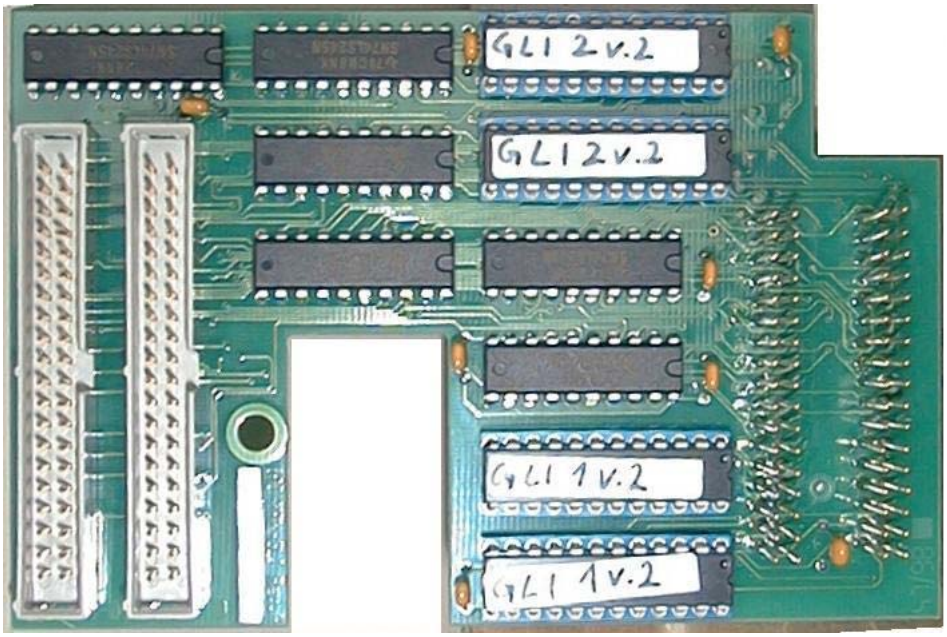
2.3 SCAMAX 2600 with Greyscale interface

For special application the SCAMAX 2600 can be fitted with a greyscale interface. The greyscale interface passes image information in 8-bit form (256 grey levels) to the scan PC.



The scan module for the front page of the document transmits the image information in 8-bit format, i.e. with 256 grey levels.
In the case of a duplex scanner the scan module for the back page simultaneously transmits the image information in 256 grey levels as well.
The greyscale interface passes the greyscale image information for the front and back page via a separate port to the scan PC.
At the same time the same image information is passed to the controller board. It converts the images to bitonal (black&white) format for the front and back respectively and transmits it separately to the scan PC.
As can be seen in the drawing, one port each for bitonal and greyscale output exists for the front page. These are connected to the PC's scanner interface (dunord-Board). For the back page identical twin ports exist. These are connected to the second scanner interface in the PC.

If the SCAMAX 2600 has a DTplus-Board fitted for each scan module that board comes with an integrated greyscale interface. Should greyscale images be required it is possible to fit a plug connection on each board (special option) to lead to outside port to transmit the greyscale signal to the PC.

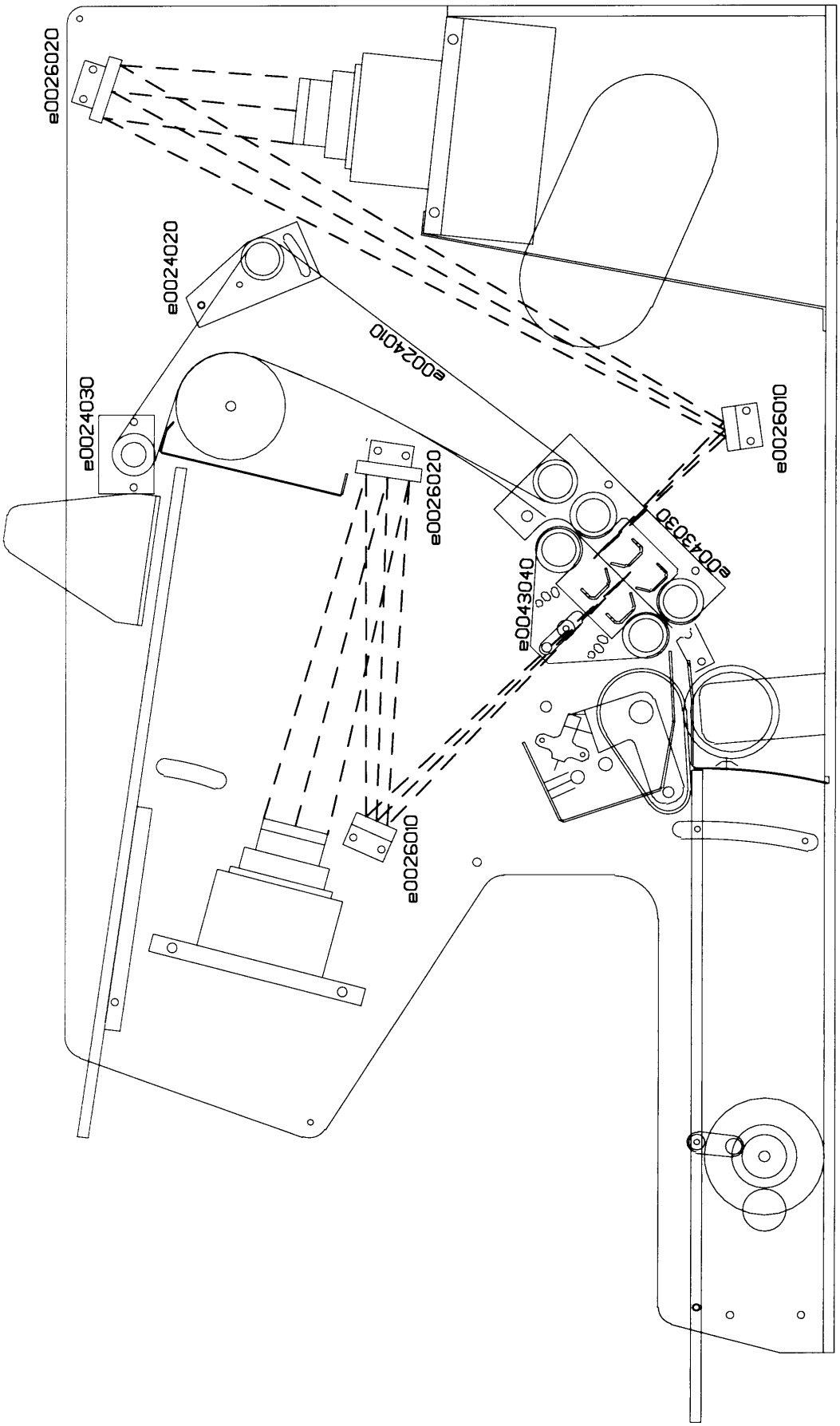


3 SCANNER COMPONENTS AND FUNCTIONS

The SCAMAX 2600/4000 scanner consists of the following main elements:
The paper transport system – it pulls sheets of paper into the scanner, transports them through the machine and deposits them in the output hopper. It consists of input hopper, which is adjustable for single sheet feed or stack feed, paper separation unit, transport mechanism and output hopper.
The illumination unit.
The optical system consisting of two mirrors plus a lens with colour filter.
The scan module 1, scanning the front of each document, is present in all SCAMAX scanners.
The scan module 2, scanning the back of each document, is only found in duplex models.
The controller board – controls all process in the machine.
The I/O board – converts TTL signals from the controller board into the signals required by the various ‚users', such as motors. It also converts outputs from sensors, such as photocells and switches, into TTL signals.
The operator panel – facilitates basic operation of the scanner, except for scan commands and internal settings.
The power supply unit – supplies the necessary voltages for the entire machine.
The ultrasound double feed detector.

Optionally fitted elements are:
One DTplus board for each scan module, which significantly enhance images from difficult documents.
The greyscale interface.
The endorser - consisting of printer unit, endorser board and photocell. Used to print date, time, and so on onto the back of each document during the scan process.

The following page shows a cross section of the SCAMAX 2600/4000 document scanner:

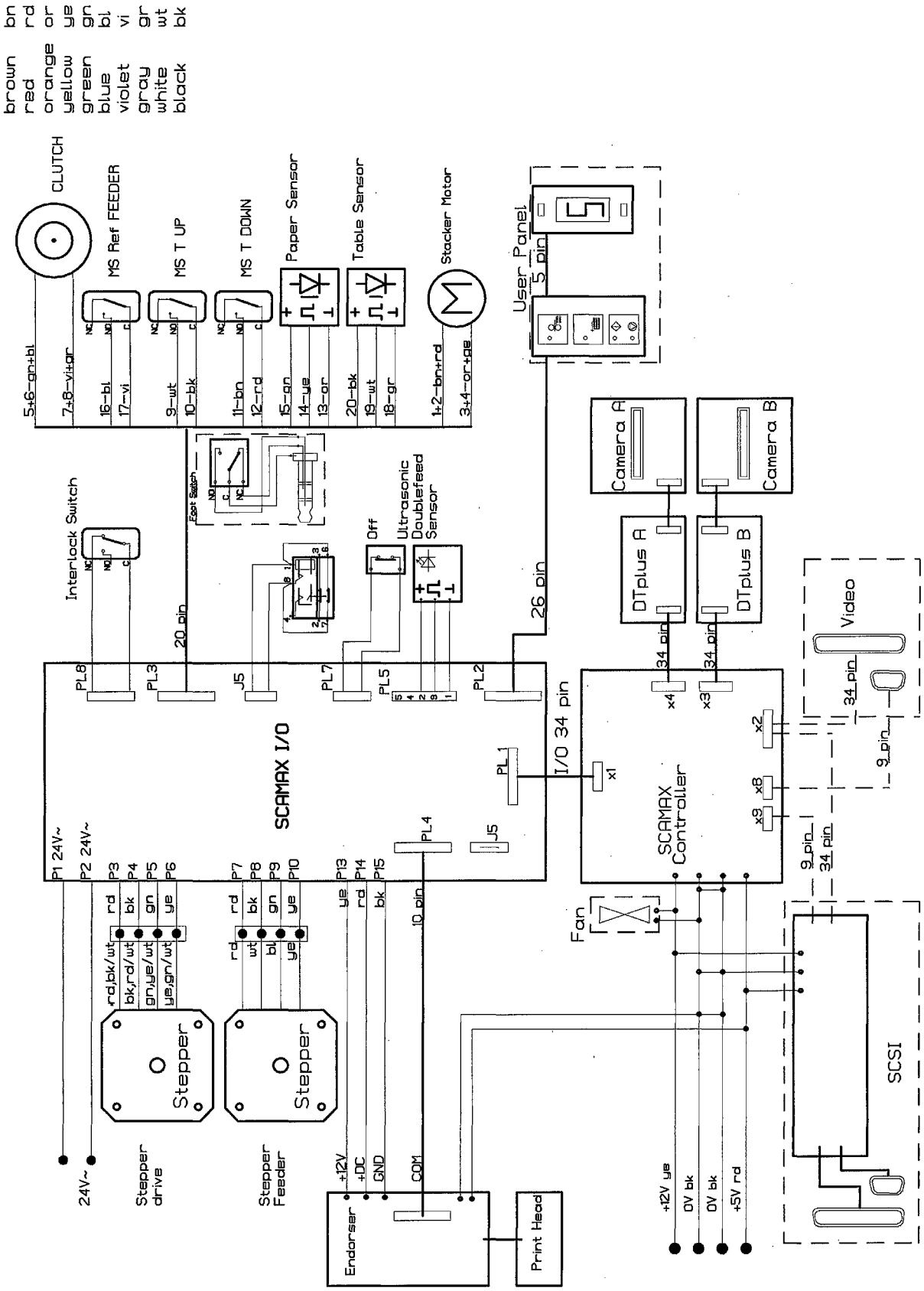

e0026020
e0024020
e0024010
e0024030
e0026020
e0026010
e0043030
e0043040
e0026010

The principal of operation is as follows:
A single sheet or a stack of documents is placed in the input hopper. A photocell detects the presence of document/s.
When the scan PC issues a scan command the machine pulls in the single sheet or top sheet of the stack via the feed roller. The sheet travels through two guide plates till a rubber roller pair grips it. The sheet reaches the scan area and is then grabbed by a second pair of rubber rollers. Subsequently, the sheet is transport around a guide plate by yellow transport belts upwards and forward till it is deposited into the output hopper.

In the scan area the sheet is illuminated by one or two fluorescent lamps, simplex or duplex. The lamps are offset to each other to minimise ‚print-through'. The light reflected from each side of the sheet contains the image information for the front and back respectively. Since the sheet is in continuous motion each line is scanned in succession.

The reflected light hits a mirror that projects the light to a second mirror. The second mirror projects the light to the lens, which sits in front of the CCD array.
The CCD converts the light containing the image information into an analogue electrical signal, which is digitised and possibly binarised in the next processing step before being transferred to the PC.

The following page shows an electrical block diagram:


brown bn
red rd
orange or
yellow ye
green gn
blue bl
violet vi
gray gr
white wt
black bk
CLUTCH
MS Ref FEEDER
MS T UP
MS T DOWN
Paper Sensor
Table Sensor
Stacker Motor
User Panel
5 pin
Interlock Switch
Fast Switch
Ultrasonic Doublefeed Sensor
Off
20 pin
26 pin
Camera A
Camera B
DTplus A
DTplus B
34 pin
Video
9 pin
SCAMAX I/O
SCAMAX Controller
I/O 34 pin
PL1
PL2
PL3
PL4
PL5
PL7
PL8
J5
x1
x2
x3
x4
x8
x9
P1 24V~
P2 24V~
P3
P4
P5
P6
P7
P8
P9
P10
P13
P14
P15
10 pin
Fan
Stepper
Stepper drive
Stepper Feeder
24V~
+12V
+DC
GND
COM
Endorser
Print Head
+12V ye
0V bk
0V bk
+5V rd
SCSI

3.1 CCD-Linear-Camera

The CCD linear camera consists of a lens unit mounted on an aluminium plate and a CCD linear sensor with associated electronics components fixed in a metal housing, which is attached to the aluminium plate.
The document to be scanned is illuminated in the scan area. The CCD linear sensor captures the reflected light containing the image information, after it has been refracted by two mirrors and passed through the lens.

CCD stands for **C**harge **C**oupled **D**evice. It is an electronic component containing capacitor elements arranged in parallel. The capacitors convert the amount of light received into electrical current, the voltage generated being proportional to the amount of light detected. An analogue-to-digital converter translates the charge for each pixel into an 8-bit digital value.

This process takes place at very high speed, the clock speed being 20 MHz. This means that each second an enormous amount of image information is read and output, i.e. 20 megapixels for bitonal and 60 megapixels for colour (20 for each channel red, green, blue).

The CCD used has 5000 light sensitive pixel elements. This number is sufficient to scan an A4 page in portrait mode (3,700 pixel) or an A3 in portrait mode (4,670 pixel) at an optical resolution of 400 dpi (dots per inch).
It is necessary to set the optical reduction in such a way that a width of 1 inch (25.4 mm) covers exactly 400 pixels on the CCD chip (see illustration next page).

For lower resolutions the pixel elements shown in the table below are deactivated:

400 dpi	X	X	X	X	X	X	X	X	X	X
300 dpi	X	X	X		X	X	X		X	X
240 dpi	X	X		X		X	X		X	
200 dpi	X		X		X		X		X	

The scan speed (paper transport speed) is automatically adjusted according to the resolution selected. 200 dpi requires only half the number of lines, thus the paper can be transported at double the speed.

	SCAMAX 2600	SCAMAX 4000
Resolution in dpi	Paper transport speed in m/min.	Paper transport speed in m/min.
200	29,3	27,5
240	24,4	X
300	19,6	18,3
400	14,7	13,8

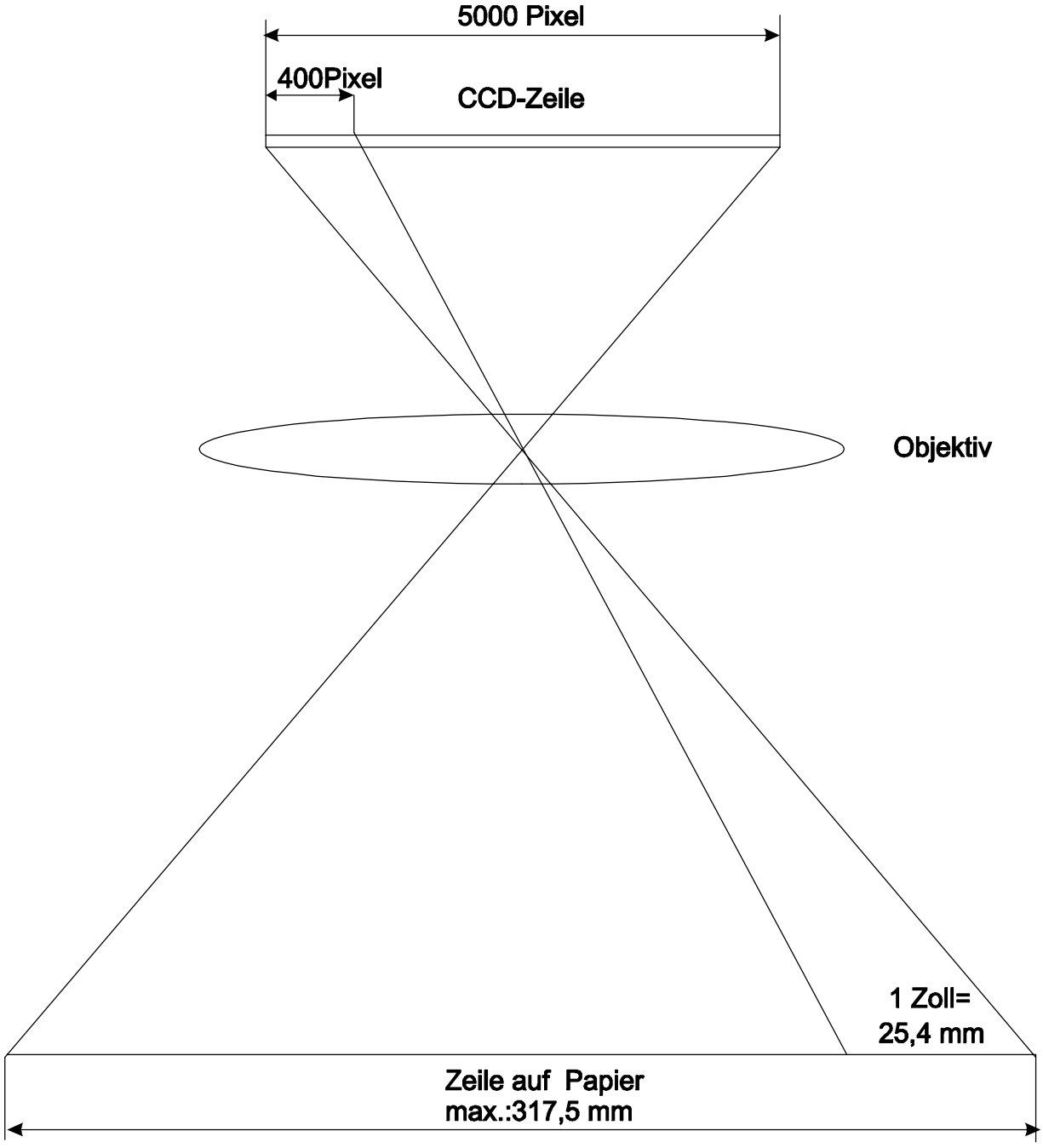


Illustration of optical reduction

The reading of the CCD linear sensor and conversion into digital values described above takes place on two channels. One channel each for odd and even pixels. With colour two channels are used for each colour.

A shielded ribbon cable is connected to the CCD board (two for colour), which provides the connection to the controller board and for colour also to the video interface.

Both mechanical and electronic adjustments are accomplished by using the service program.

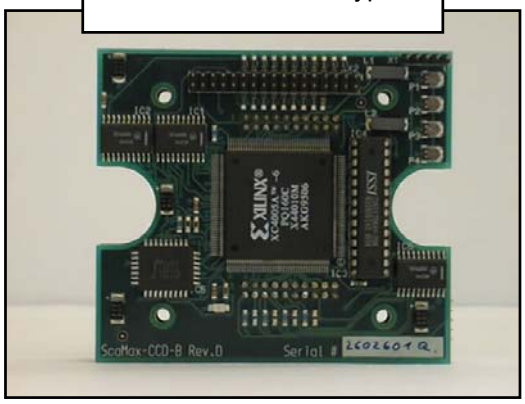
3.1.1 Camera types

Two different types of CCD linear cameras are used for the SCAMAX®*2600/4000* scanners.

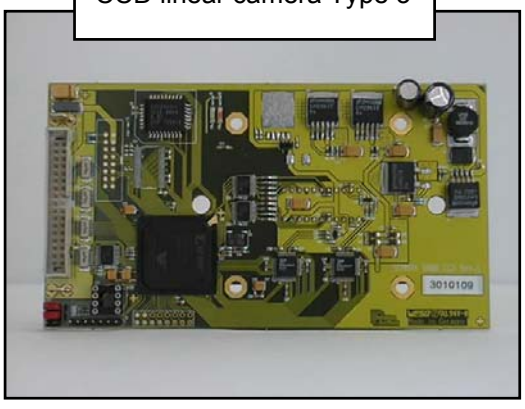
SCAMAX®*2600*: B&W CCD linear camera Type 0
B&W CCD linear camera Type 3

SCAMAX®*4000*: Colour CCD linear camera Type 2

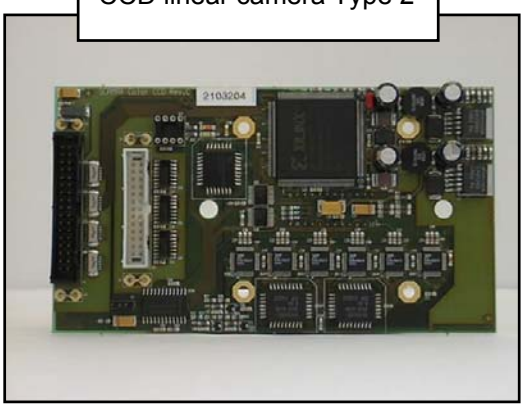
CCD linear camera Type 0



CCD linear camera Type 3



CCD linear camera Type 2



3.1.2 Camera Faults

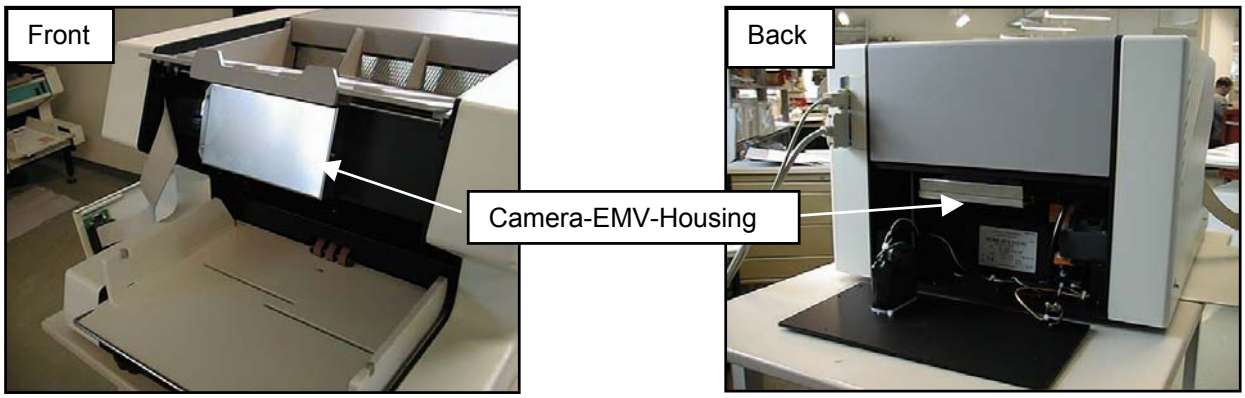
The service program is used to determine whether a camera is faulty. The program can display the camera status. If the camera status is shown as OK it is possible that the camera sends wrong data or no data at all. This fact would be shown by an unexpected curve formation, heavy noise or absence of a channel. If a problem is diagnosed it will not be immediately obvious whether it is caused by the camera board and/or the CCD sensor. Therefore, several solutions present themselves. In the majority of cases an exchange of the camera board will yield the result desired. This methodology has the advantage of retaining the optical alignment of the camera.

3.1.2.1 Changing Camera Board Type 2+3

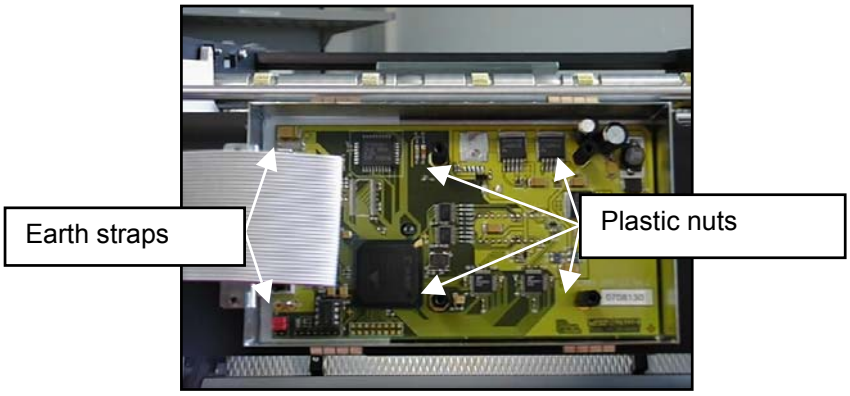
Switch off Scanner!

All activities have to undertaken in accordance with current ESD regulations!

Remove the two screws of the EMV camera housing and lift lid.



Pull the post connector from the board (1x for SCAMAX®*2600* and 2x for SCAMAX®*4000*) and un-screw the four plastic nuts.



Using a pair of pliers pull the board backwards out of the housing by the earth straps. Ensure the board is pulled squarely out of the housing; otherwise the CCD sensor's contact pins will be bent.
Carefully insert the new board and fasten using the plastic nuts.

Replace the post connector and switch the scanner on. The next step is to set CCD sample delay, which calculates and adjusts run time differences of the various components, using the service program. To set the CCD sample delay insert a sheet of white calibration paper in portrait mode into the scanner and transport it past the roller pair. Press the "D" key and follow the menu instructions. When finished insert the sheet in landscape mode and perform a white calibration ("M" key).

If the service program's camera signal display does not show an improvement re-insert the original camera board and exchange the CCD sensor as described under 1.1.2.3 instead.

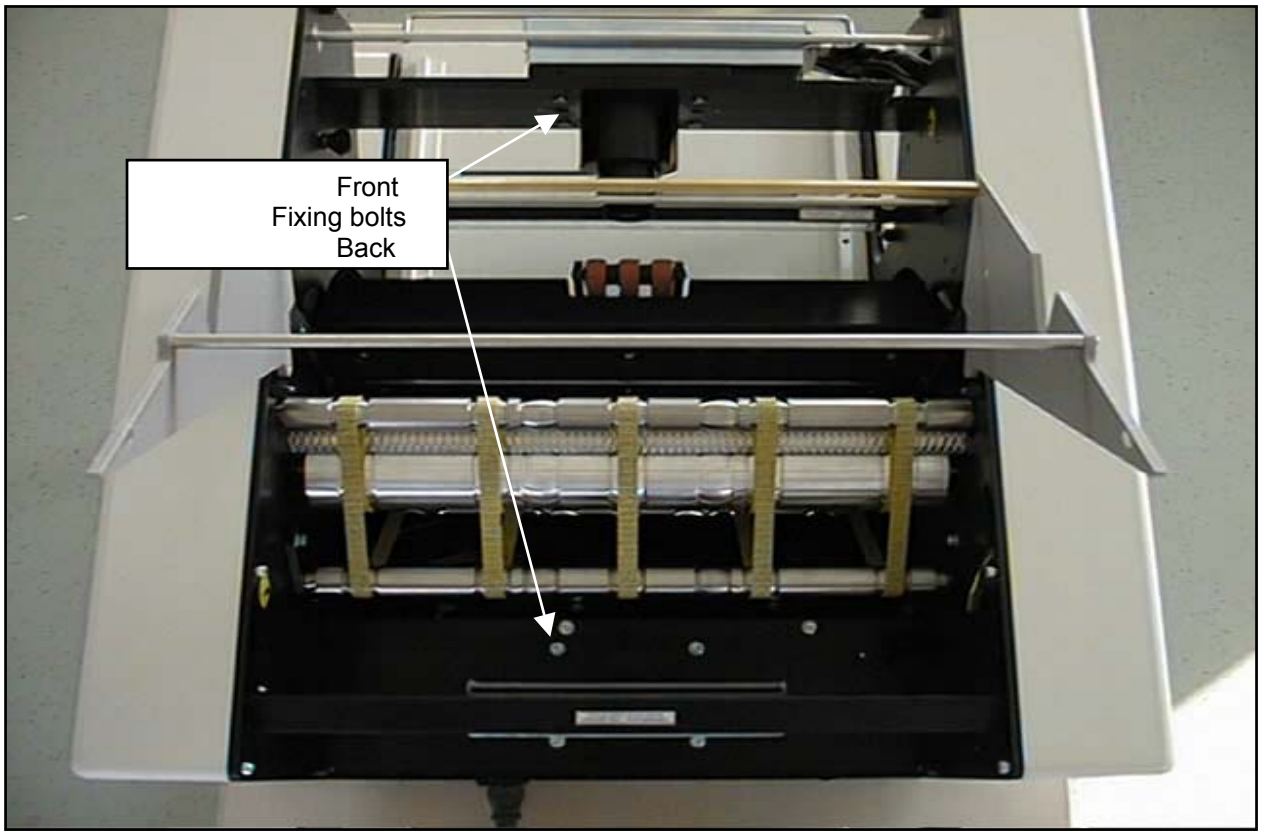
3.1.2.2 Changing Camera Board Type 0

The difference to the procedure described under 1.1.2.1 is that the camera type 0 has two boards mounted on top of each other. The board having the potentiometers is mounted on the CCD board, it can simply be pulled off. The CCD board is fastened with four nuts (M3) and have to be unscrewed prior to removal of the board. When fitting the new boards ensure that they sit squarely one on top of the other. The camera signals are to be adjusted as described under 1.1.2.5.

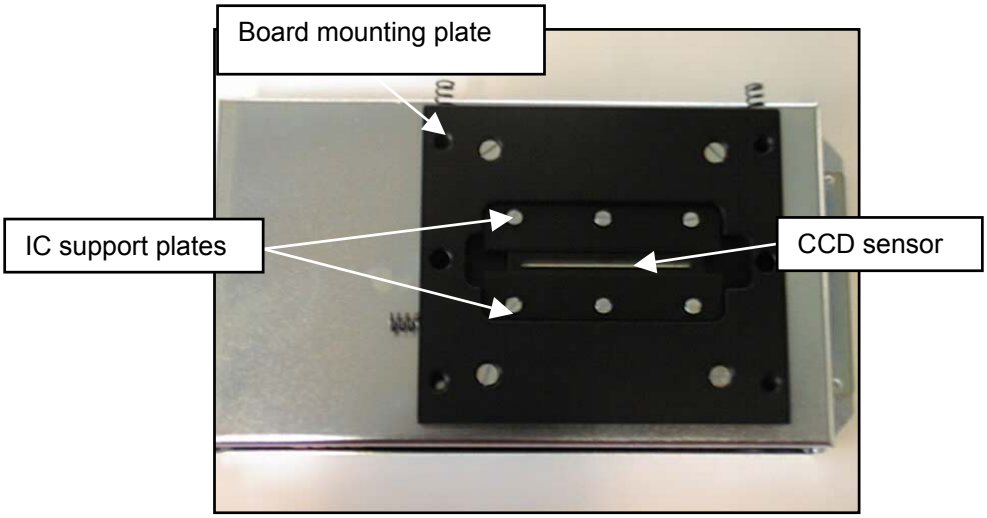
3.1.2.3 Changing the CCD Linear Sensor

All activities have to undertaken in accordance with current ESD regulations!

To change the CCD sensor it is necessary to remove the entire camera unit (consisting of: board. EMV housing, board mounting plate and CCD sensor) from the scanner. Unscrew the fixing bolts (M4x10) and remove the EMV housing with board mounting plate.



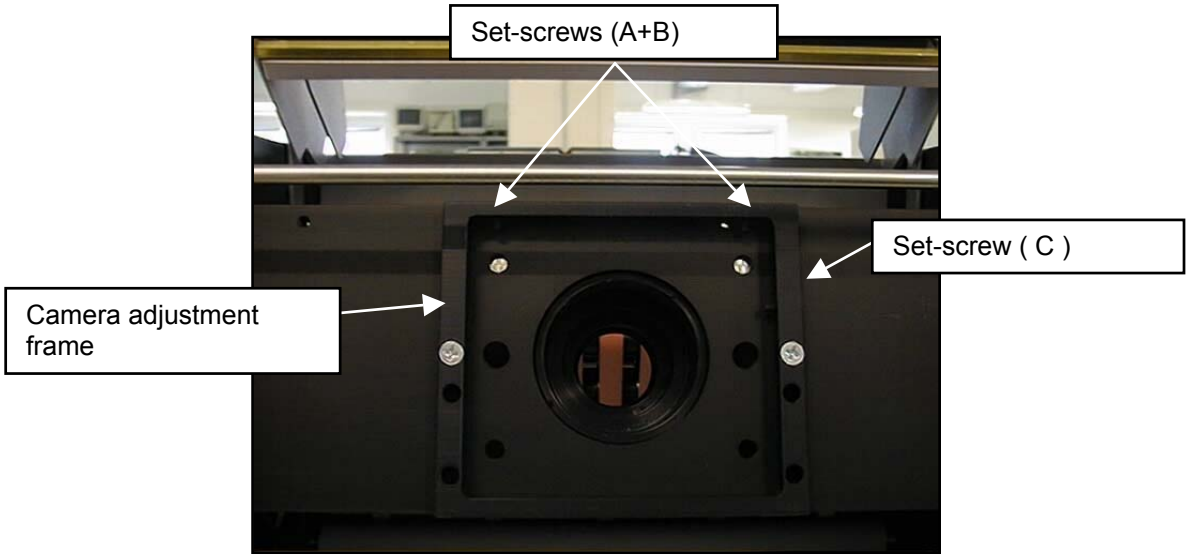
Unscrew the IC support plates and mark the position of the CCD sensor on the board mounting plate.



Plug the new CCD sensor into the IC socket on the board and align to the previously marked position. **CAUTION!** Check polarity.

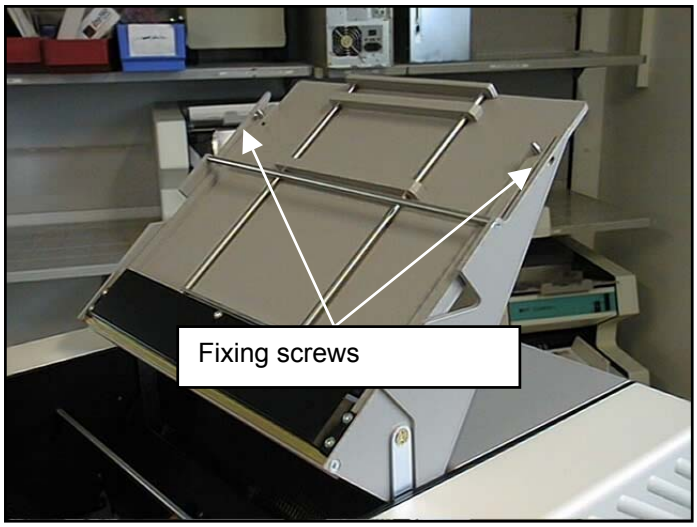
Fasten IC support plates. The new CCD sensor must be absolutely free from dust and grease. Clean it.

Insert the complete camera unit into the adjustment frame, ensuring the springs are forward. Check that springs are not bent. Compress the springs sufficiently to ensure the board mounting plate seats properly behind the set-screws. Fasten fixing bolts, then undo them again a quarter of a turn. The camera should now be movable within the adjustment frame.



3.1.2.4 Camera Adjustment for SCAMAX®*2600* Type 3

The lamps must have reached their proper operating temperature prior to adjustment of the camera via the service program (operating period about 10 mins.).
To facilitate camera adjustment it is necessary to remove the output hopper plate by removing the two fixing screws. Ensure the washers, which are located between the output hopper plate and the side plates, don't fall into the scanner. After removing the output hopper plate close the folding mechanism.



Switch on the scanner and start the ScanServ program. Select menu item 'Camera-Test'. (To change to the backside camera press F10).

Setting the camera's straight line position

Insert a white sheet of paper in landscape mode. Sight across the edge of the camera's base plate (illustration 2 + 3) to the top paper roller. Paper roller and edge of paper must be parallel. Transport paper step-by-step into the scan slot.
By turning the set-screws (A + B) a quarter of turn at a time adjust the camera until the left and right side of the signal deflect at the same time (illustration 1) when a sheet of paper enters the scan slot (illustration 4). Avoid turning only one set-screw too much.

Right side signal leads: turn in left set-screw and/or turn out right set-screw.
Left side signal leads: turn out left set-screw and/or turn in right set-screw.
If the signal gets markedly worse when adjusting the camera (camera looks at edge of lamp holder) reverse the adjustment and attempt to obtain the necessary adjustment by using the other set-screw.

Ensure enough play remains in the adjustment frame to allow for further manipulation.

When both side deflect evenly (illustration 1) adjust the camera in such a way that the edge of the paper is in the middle of the scan slot (illustration 4) when maximum deflection (illustration 5) is reached. For the backside the lamp holder and the paper rollers limit the scan slot.

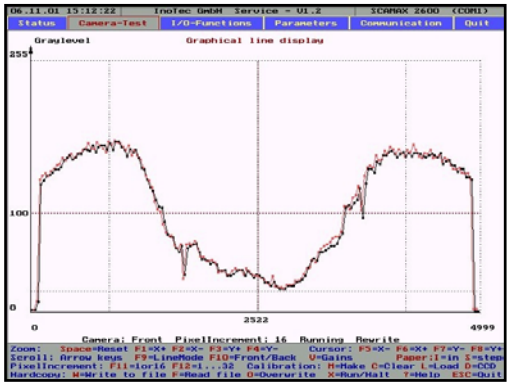


Illustration 1

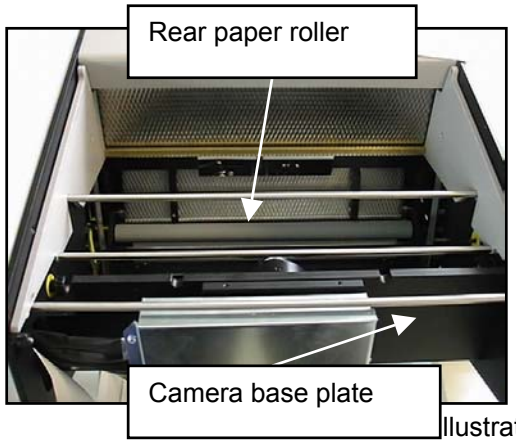


Illustration 2

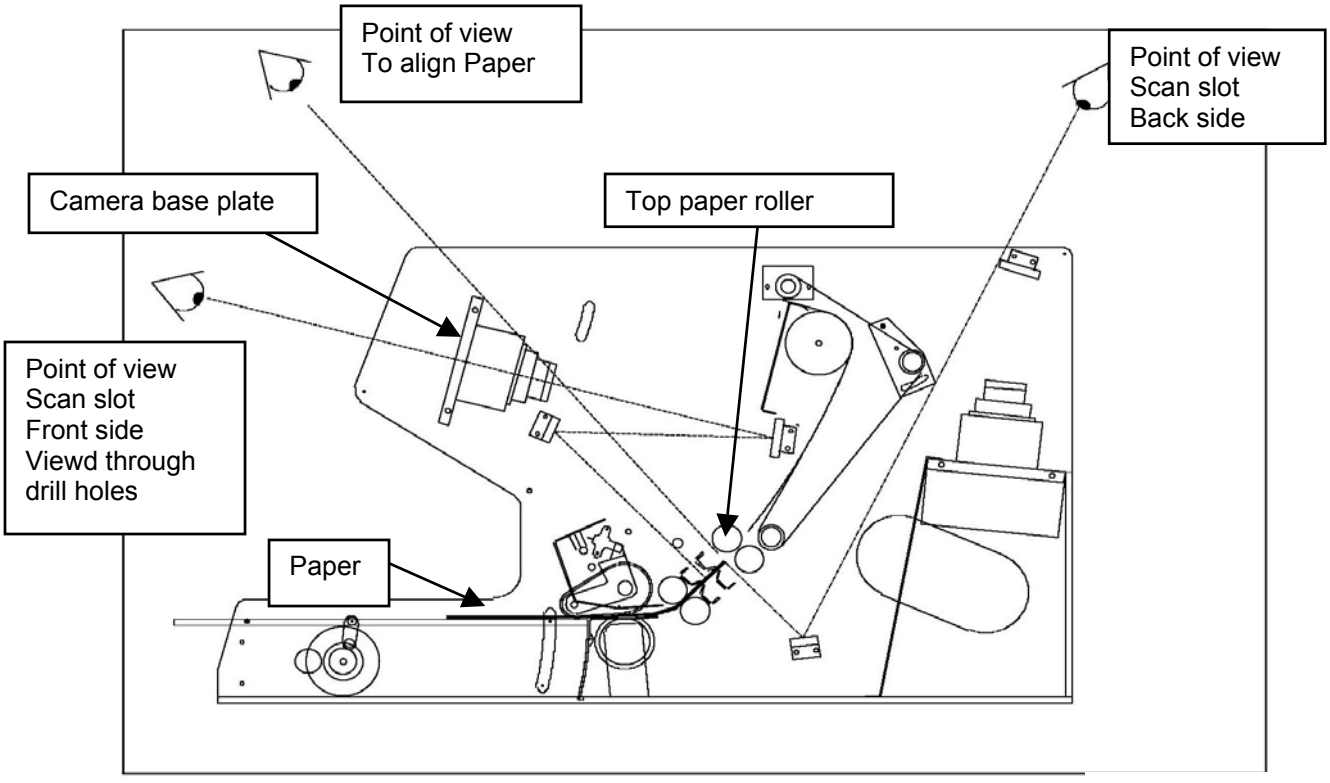


Illustration 3

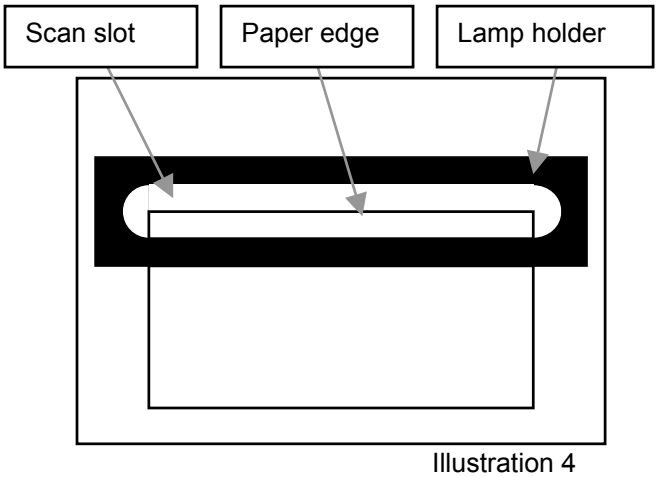


Illustration 4

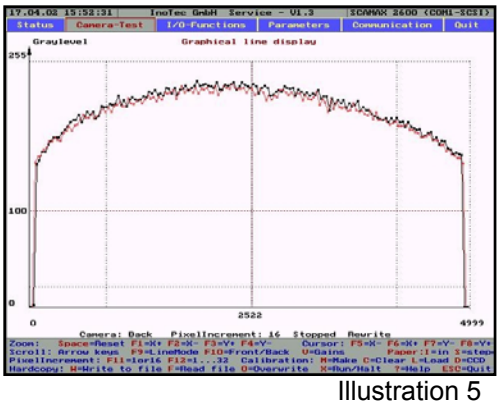
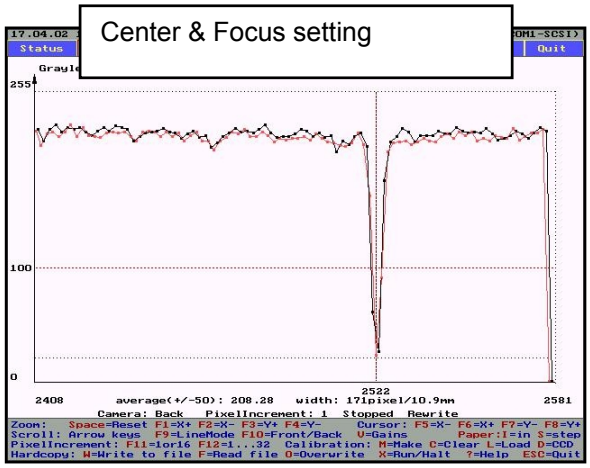
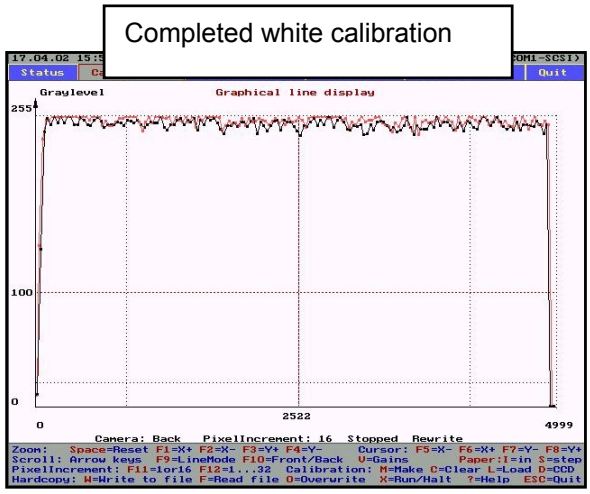


Illustration 5

Centring is performed using an *InoTec* test sheet. The test sheet is placed in the scanner centred (without play at the side paper guides). Drive the sheet into the scanner until the centre line on the sheet is in the scan slot. Press F1 fifteen times to enlarge the display. Press F11 to display each pixel. Use the arrow keys to scroll to the centre (auxiliary line 2522). Use set-screw (C) to centre the camera. Next, adjust focus. Loosen the set-screw in the lens holder; turn the lens holder till maximum deflection is achieved. Fasten camera and lens holder and check centre setting again.



Set CCD sample delay („D“ key). When completed insert sheet in landscape mode and perform white calibration („M“ key).

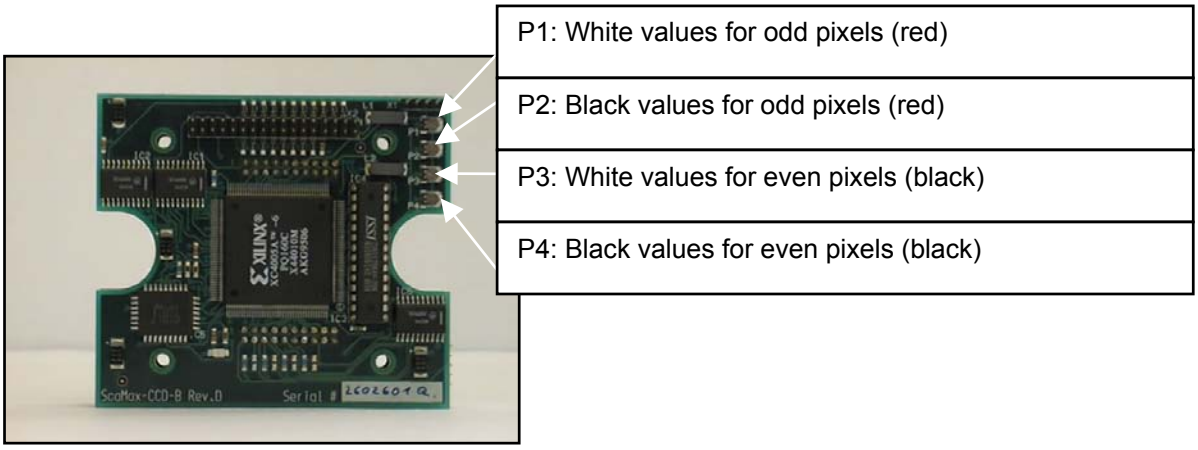


Focus is checked by scanning at 400dpi. All image processing options (cropping, deskew, filters, etc.) have to be switched off and a fixed threshold must be used. Use the *InoTec* test sheet for this purpose. Focus is OK when the direction of the DIN test symbols (screw heads) is at least 50% recognizable at a value of 60. The grey scale's raster should be resolved in at least 5 – 8 fields. If these conditions are not met, focus has to be re-adjusted.

3.1.2.5 Camera Adjustment for SCAMAX®*2600* Type 0.

When adjusting camera type 0 the following differences to type 3 must be observed.
Black and white values must be set manually by using the four potentiometers. Furthermore, it is not possible to set the CCD sample delay for the type 0.
The red channel is responsible for200 dpi.

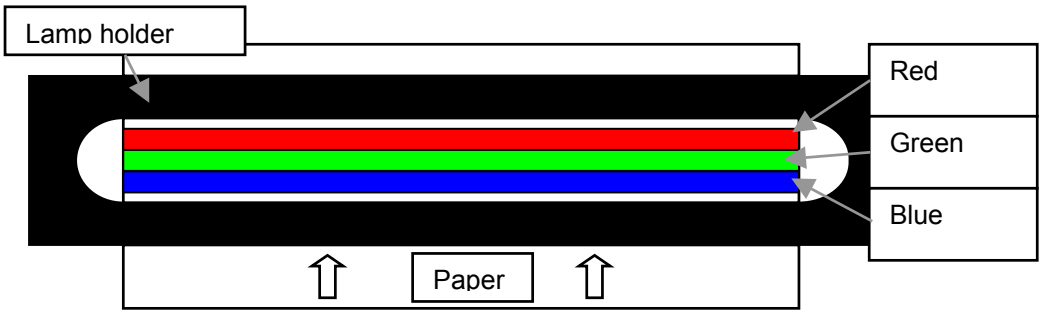
To adjust the black values insert a sheet of black calibration paper in landscape mode into the scanner. Using the service program, menu option 'Camera-Test', the camera signal is adjusted to a value of 20 (lower auxiliary line) via potentiometers P2 and P4. Both channels must be identical. Remove the black calibration sheet and replace it with a white calibration sheet to adjust the white values. White values are set to about 240 (highest point of the curve) by using potentiometers P1 and P3. Since white and black values influence each other to some degree it will be necessary to re-check the black values and re-adjust them as necessary.



3.1.2.6 Camera Adjustment for SCAMAX®*4000* Type 2

This section only covers the differences applicable to the camera adjustment for the SCAMAX®*4000*t.

To set the straight line position one has to change to the green channel ("G" key), since that is the one which is red in the centre of the scan slot. (sequence: blue, green, red) The reason is that the Colour CCD sensor is made up of three separate CCD sensors, one for each colour, which are physically apart from each other.



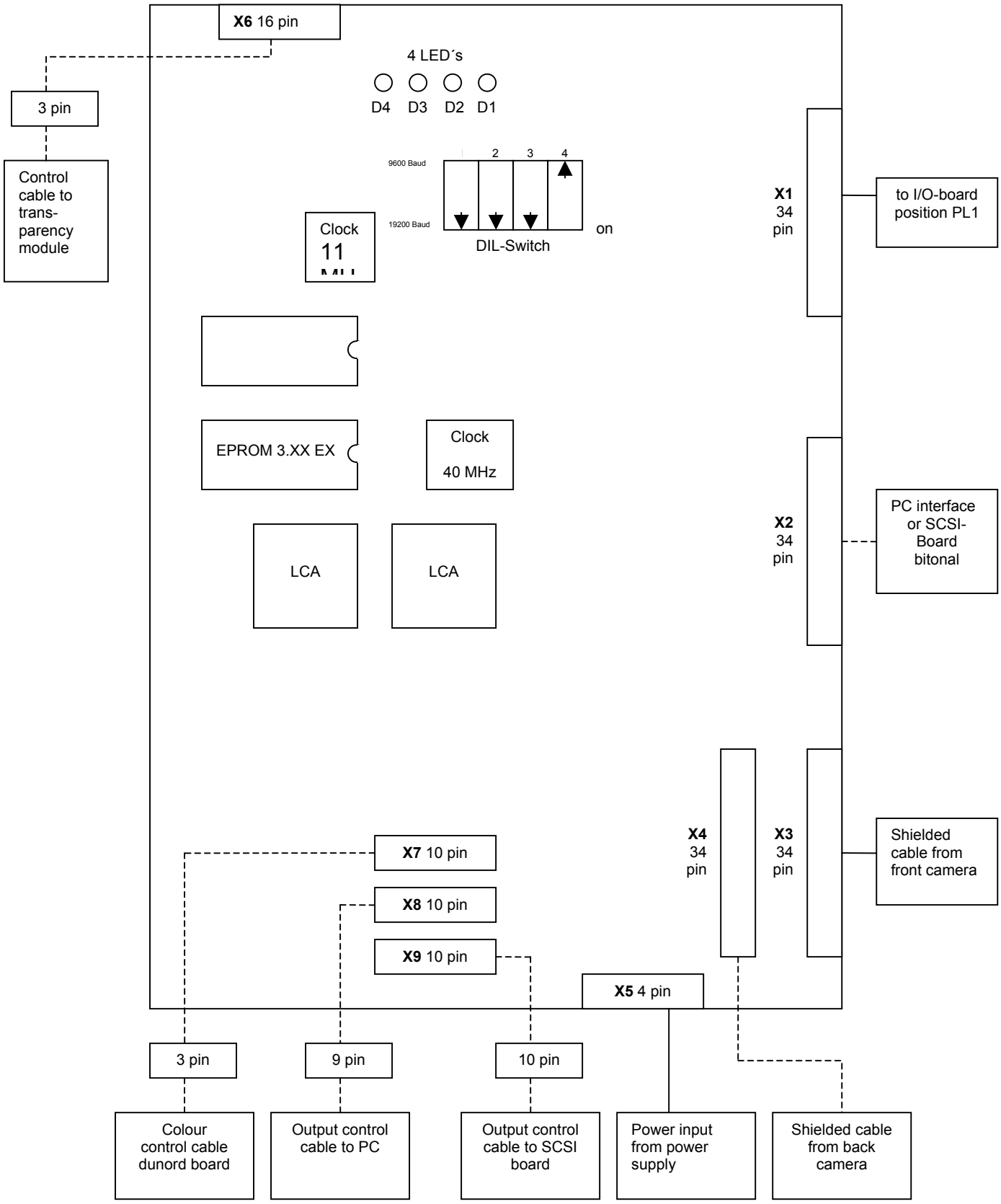
Centring is performed using an *InoTec* test sheet. Scanning has to done at 400dpi **(IMPORTANT:** switch off cropping and deskew). View the resulting image using an image viewer. If the image shows a black border on one side the camera has to be adjusted via the set-screw (C). This process has to be repeated until the test sheet image is perfectly centred in the image viewer. When centred fasten the camera. Re-check centring after fastening.

Setting the CCD sample delay is only possible from ScanServ Version 1.4 and Firmware 3.25 EC.

Focus is checked by scanning at 400dpi, using the *InoTec* test sheet. Focus is OK when the direction of the DIN test symbols (screw heads) is at least 50% recognizable at a value of 60.

To finish another white calibration has to be performed, which takes a while for the SCAMAX®*4000* (approx. 7-8 mins per side).

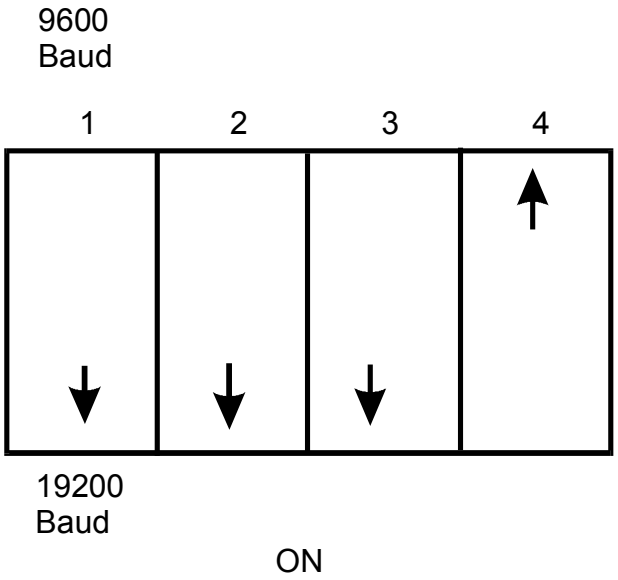
3.2 Controller-Board Rev. B



The controller board manages all functions of the SCAMAX 2600/4000.
The scanner communicates with the scan PC via a serial interface (RS232), which controls the cameras, motors, Dtplus boards and the endorser, according to commands received.

In addition, with the SCAMAX2600, image data from the cameras are processed for video interface (8 Bit parallel). Binarisation, when using fixed threshold or one-dimensional automatic threshold, is executed in the LCA's of the controller as well.

DIL-Switches are used to set the baud rate and select the appropriate scanner type. As can be seen from the diagram switch 1 is used to set the baud rate. It should always be set to 19200. Switches 2 to 4 are to be set according to the table below.

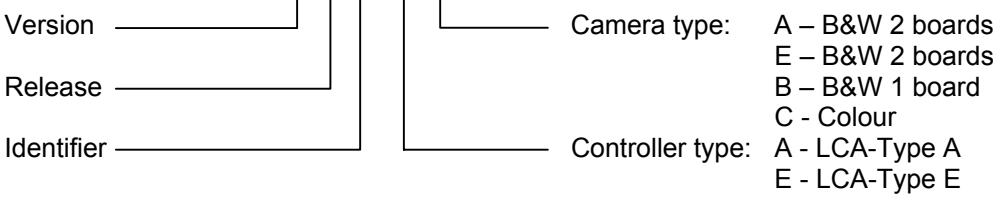


	DIL Switch			
	1	2	3	4
9600 Baud	Off			
19200 Baud	On			
SCAMAX 5000		Off	Off	Off
SCAMAX 2500		On	Off	Off
SCAMAX 4000		Off	On	Off
SCAMAX 2600		On	On	Off

An EPROM of the type 27C512 is used to store the firmware for the SCAMAX 2600/4000. The firmware can be exchanged or updated by changing the EPROM. Firmware is downward compatible, which means newer firmware will be fully functional with older hardware versions.

The EPROM label shows the firmware version as well as the camera and controller type.

Example: **3.2.1 E B**



(Type A is only found in older SCAMAX 2500 or 5000)

An EEPROM stores parameter values by busing the service program. As well, it stores the corrections values after a white calibration has been executed for both scanner modules.

The RS232 (10-strand ribbon cable) of the external interface to the PC, is connected to X8 as shown.
In case of a SCSI scanner, the cable from the SCSI board is connected to X9.
X7 is only used in the SCAMAX 4000 and older SCAMAX 5000 scanners.

3.3 Exchanging the Controller Board

Switch off the Scanner!

All activities are to be conducted according to current ESD regulations!

Prior to exchanging the controller board the scan counter has to be read using the service program (menu item: STATUS). As well, the parameter file (menu item PARAMETERS) has to be saved. The value of the scan counter has to be written down. If communication is impossible due to a faulty controller, these parameters can be obtained from InoTec by quoting the scanner's serial number.

Action necessary for the changeover:

1.) Remove the left hand cover and the cover plate of the controller
2.) Remove all cables and the EPROM (FIRMWARE) from the controller
3.) Remove the four M4 nuts and change the board
4.) DIL-Switch to be set according to old controller. Re-fit EPROM and cables
5.) Note scan counter of new controller and, if at hand, load parameter file
6.) If parameter is not available, load default values and set values according to the values given by InoTec
7.) For scanners of the type 2600 the sample delay has to be set and a white calibration performed (see point 3.2.1.4)
8.) For scanners of the type 4000 perform a white calibration

Return the faulty controller board to InoTec together with the scanner's serial number and scan counter values.

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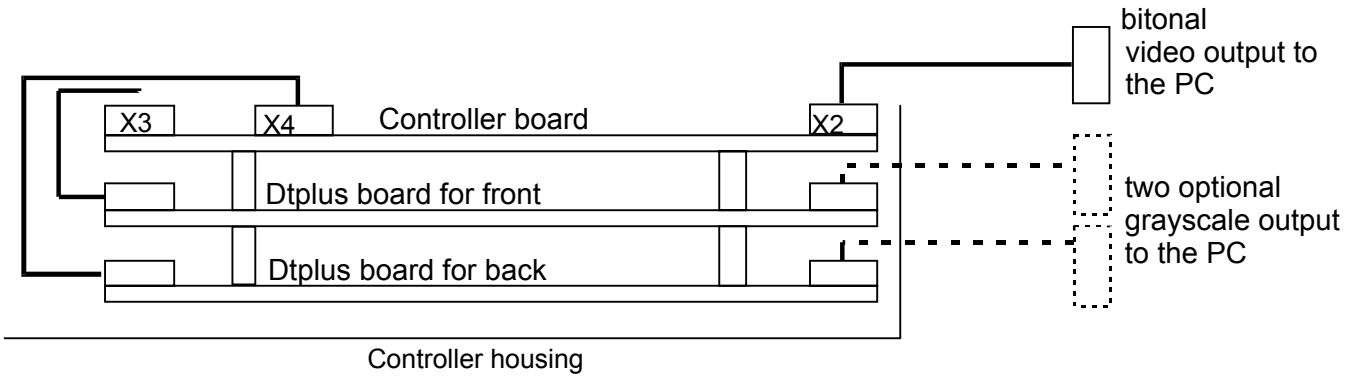
3.4 DTplus Board

The DTplus board is an optional accessory for the SCAMAX 2600. It enables two-dimensional binarisation, which is particularly useful for low contrast documents or those with certain colour hue mixes.

A separate DTplus board is required for each camera (front and back).

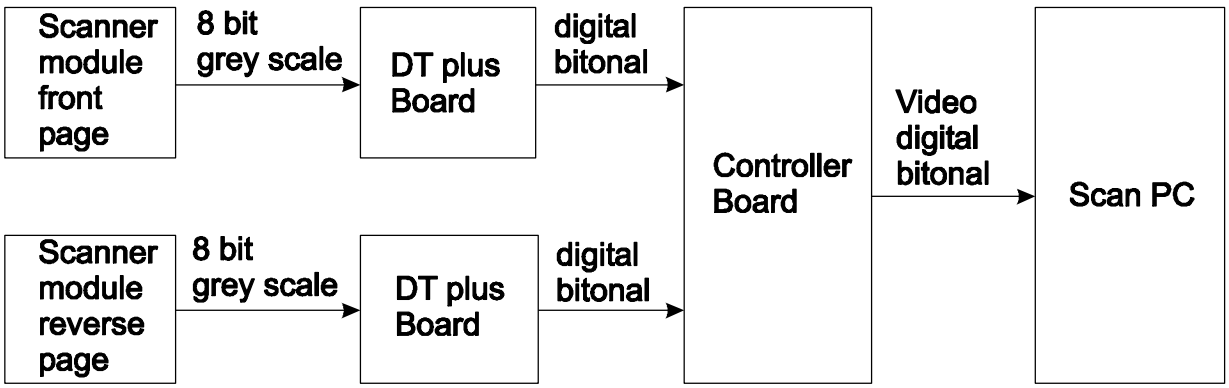
The DT plus boards are fitted below the controller board in the same EMC metal housing.

The following sketch shows the cable distribution in detail:



A fan evacuates the heat generated by the DTplus board.
The fan must be checked and if necessary cleaned during each preventative maintenance session!
If a DTplus board is not installed no fan will be fitted.

The DT plus board sits logically between the camera (front and back respectively) and the controller board:

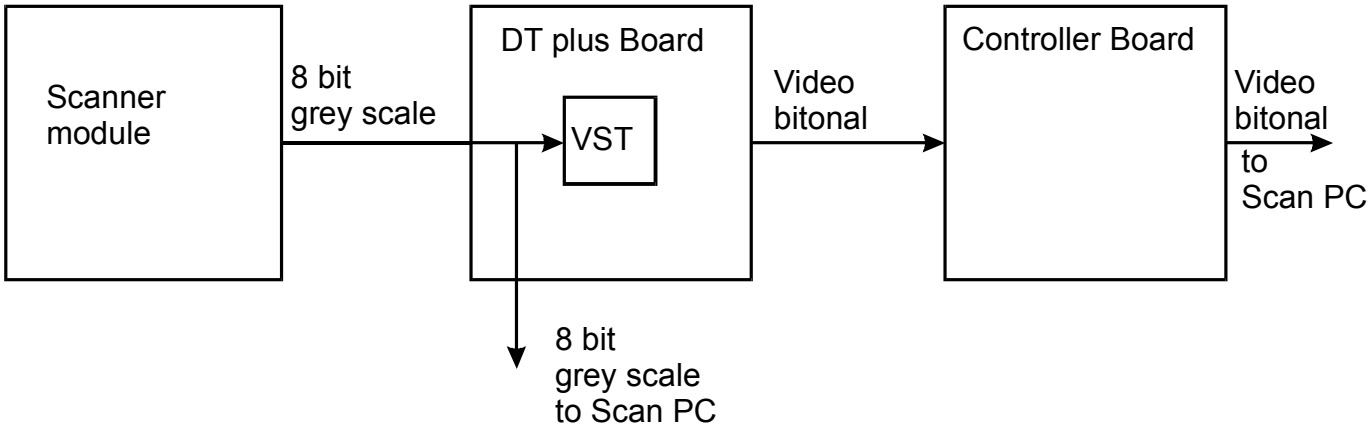


The actual function of this binarisation method is additionally described in detail in „From grey to black&white“.

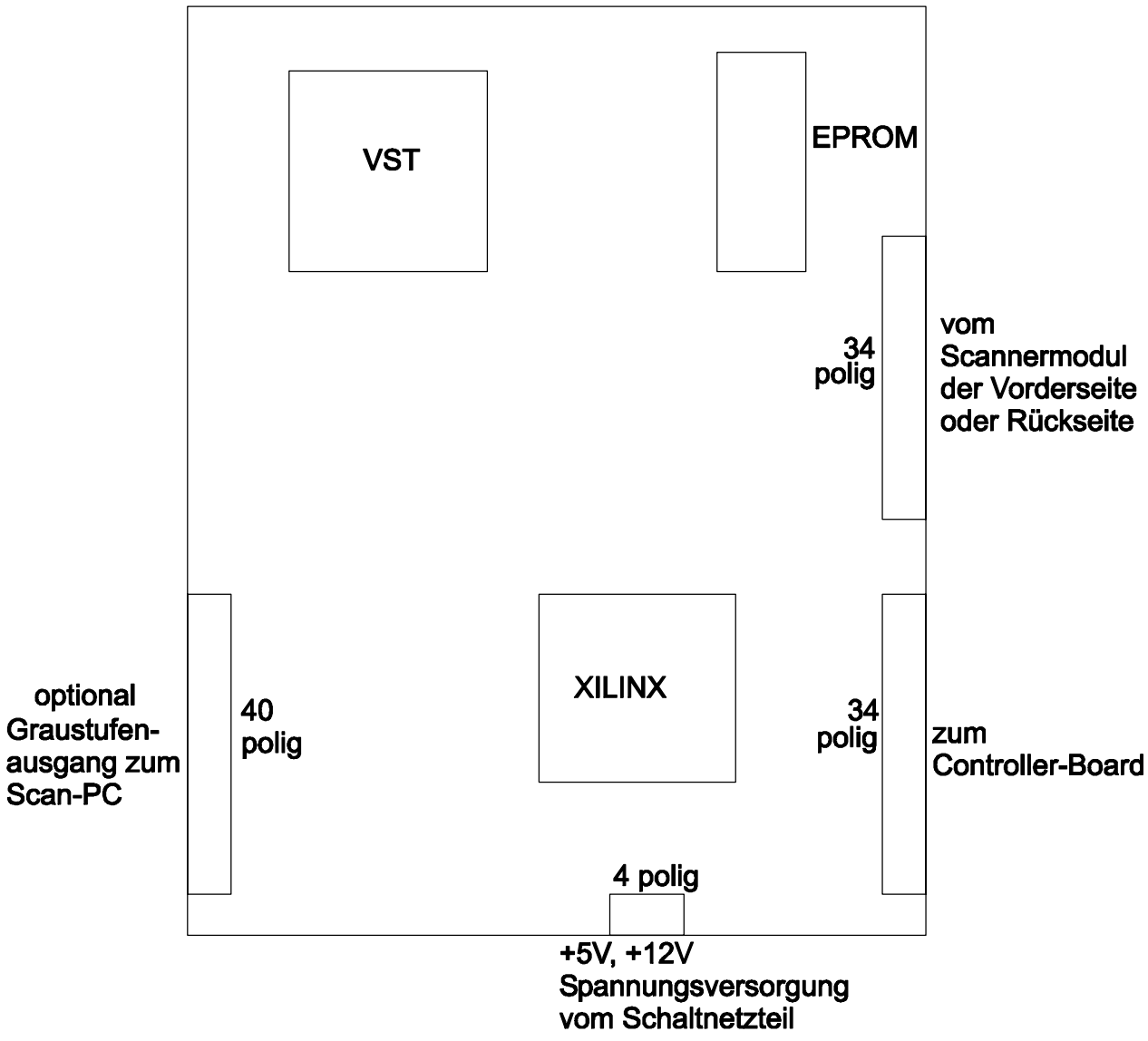
Another available option is the possibility to fit, in addition to the bitonal video port, a greyscale port to the scan PC on each DTplus board. This is relatively simple since the 8-bit greyscale signal received by the

camera can easily be led to the scan PC. To achieve this, the 40-pin plug on the DTplus board is connected to the scan PC.

For EMV technical reasons these plugs are only fitted if this feature is actually being used.



DT plus-Board



3.5 I/O Board

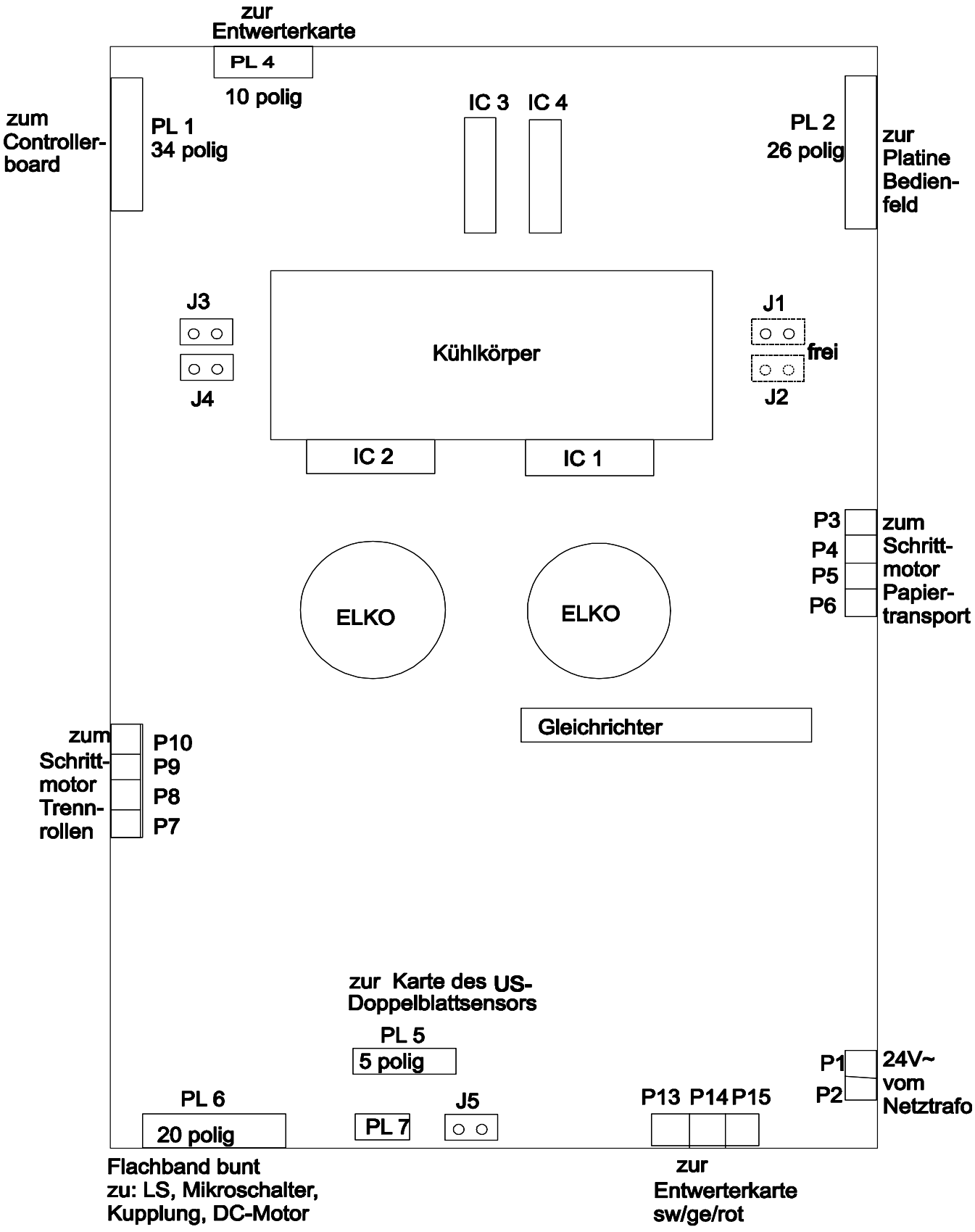
The I/O board converts the TTL signals from the controller board to signals required by the various 'users', such as motors and so on. Conversely, it converts output from sensors, photocells and switches into TTL signals.

This board controls the following components:
the paper transport stepper motor
the stepper motor that sets the paper thickness
the DC elevator motor for the input hopper plate
the solenoid clutch.
the photocell that senses paper in the input hopper
the photocell fork next to the initial feed roller
the ultrasound double feed detector

The following four microswitches (found on the left hand side of the machine) are connected to the I/O board:
two microswitches controlling the positioning of the input hopper plate for single sheet feed; one at the top, the other at the bottom
one microswitch that signals the reference position of the paper thickness setting
and one microswitch that switches off the entire paper transport (motor, etc) when the output hopper is lifted upwards. This is a safety measure to prevent injury.

The operator panel switches are connected to the I/O board via a ribbon cable. The board also has an interface for the endorser.

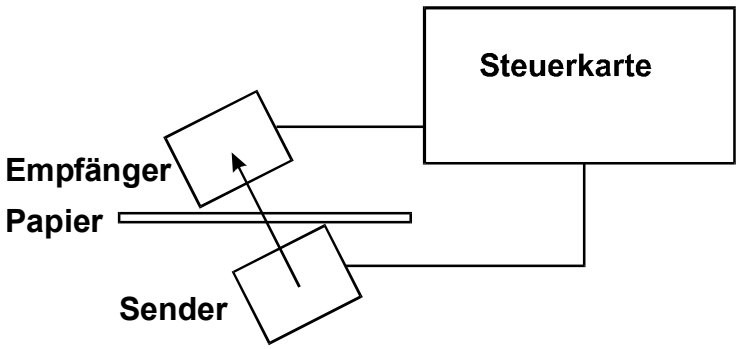
Power supplied is 24V~ from the power supply transformer. The current is rectified on the I/O board to output +16V to the DC motor for the input hopper plate and +12V to the endorser, as well as about +38V to the stepper motors and clutch.


zur
Entwerterkarte
PL 4
10 polig
zum
Controller-
board
PL 1
34 polig
IC 3
IC 4
PL 2
26 polig
zur
Platine
Bedien-
feld
J3
J4
Kühlkörper
J1
frei
J2
IC 2
IC 1
P3
P4
P5
P6
zum
Schritt-
motor
Papier-
transport
ELKO
ELKO
Gleichrichter
zum
Schritt-
motor
Trenn-
rollen
P10
P9
P8
P7
zur Karte des US-
Doppelblattsensors
PL 5
5 polig
P1
P2
24V~
vom
Netztrafo
PL 6
20 polig
PL 7
J5
P13 P14 P15
Flachband bunt
zu: LS, Mikroschalter,
Kupplung, DC-Motor
zur
Entwerterkarte
sw/ge/rot

3.6 Ultrasound Double-feed Detector

The ultrasound double-feed detector recognizes two or more sheets of paper being fed simultaneously. It stops the scanner or issues an error message.
It is located to the left of the initial feed rollers.
The system consists of:
one ultrasound transmitter
one ultrasound receiver
one control board

The principle of operation is as follows:
As the paper is pulled into the scanner it passes between the ultrasound transmitter and receiver.
The transmitter and receiver are aligned on a level that forms an angle of 60° to the paper level. The gap between transmitter and receiver is 40 mm. Paper passes trough the unit at a distance of about 7 mm from the transmitter.
The ultrasound transmitter generates ultrasound waves (>20 kHz) that travel through the paper and are received by the ultrasound sensor. The control board measures the resulting reduction in amplitude.



IMPORTANT: it is the recognition of air-paper divisions that matters, not the thickness of the paper!

An error message is displayed on the monitor of the scan PC depending on the user software employed.

The **ultrasound double-feed detector** is **active** when the **paper separation** is **on**. Turning the paper separation off also deactivates the ultrasound double-feed detection.

A push button is located at the left of the SCAMAX 2600/4000 feeder front panel. Ultrasound double-feed detection is turned off as long as this button is pushed yet paper separation remains active.

3.7 Footswitch

The footswitch is used when thick, stapled or folded documents are to be scanned.

Turning the paper separation on and off can be done with the footswitch. The footswitch cable is plugged into a socket at the back of the scanner. As long as the footswitch is depressed paper separation is turned off and the ultrasound double-feed detector is deactivated. The separator rollers are lowered (move away from the red bands of the initial feed roller), which allows passage of documents up to the maximum paper thickness without changing the paper thickness selector.

3.8 Endorser

The endorser prints information like date, time, sequence number and so on, on the back of the documents during the scan process.
The endorser unit has the following components:
Printhead complete
Photocell
Processor board

3.8.1 Printhead

The printhead is located beneath the top cover. It is mounted on a guide rod, which facilitates sideways movement of the print unit.
The printhead and the processor board are connected via a 28-strand ribbon cable. A motor drives the inkjet cartridge from the standby position, where the jets are covered, to the print position and vice versa.

Inkjet cartridges supported are: CANON BC 01
PELIKAN Easy Click for BJ-10e/BJ-200

3.8.2 Photocell

The photocell is a photoelectric reflection sensor that is built into the paper transport path. It is housed within a rectangular cutout in the guide plate. The senor recognises the leading edge of the document and initiates the print process after an appropriate delay.

The engagement of the clutch at the start of a scan process causes the print head to drive into the print position. If no printing takes place for a given period of time (usually 1 min.) the print head drives into the standby position and the jets are covered.

3.8.3 Processor Board

The processor board translates the text information transferred to it by the controller via the serial interface into a pixel pattern and controls the individual jets of the inkjet cartridge during the print process.

Once the specific settings have been transmitted to the endorser and it is activated it works asynchronous to the scanner control of the controller board. This means each document that passes the photocell will be printed on. This principle of operation applies to both regular documents as well as double feeds and/or oversized documents. The sequence number is automatically increased after each print cycle, regardless of the status of the scanner controller. A real-time clock with battery back up supplies date and time information.

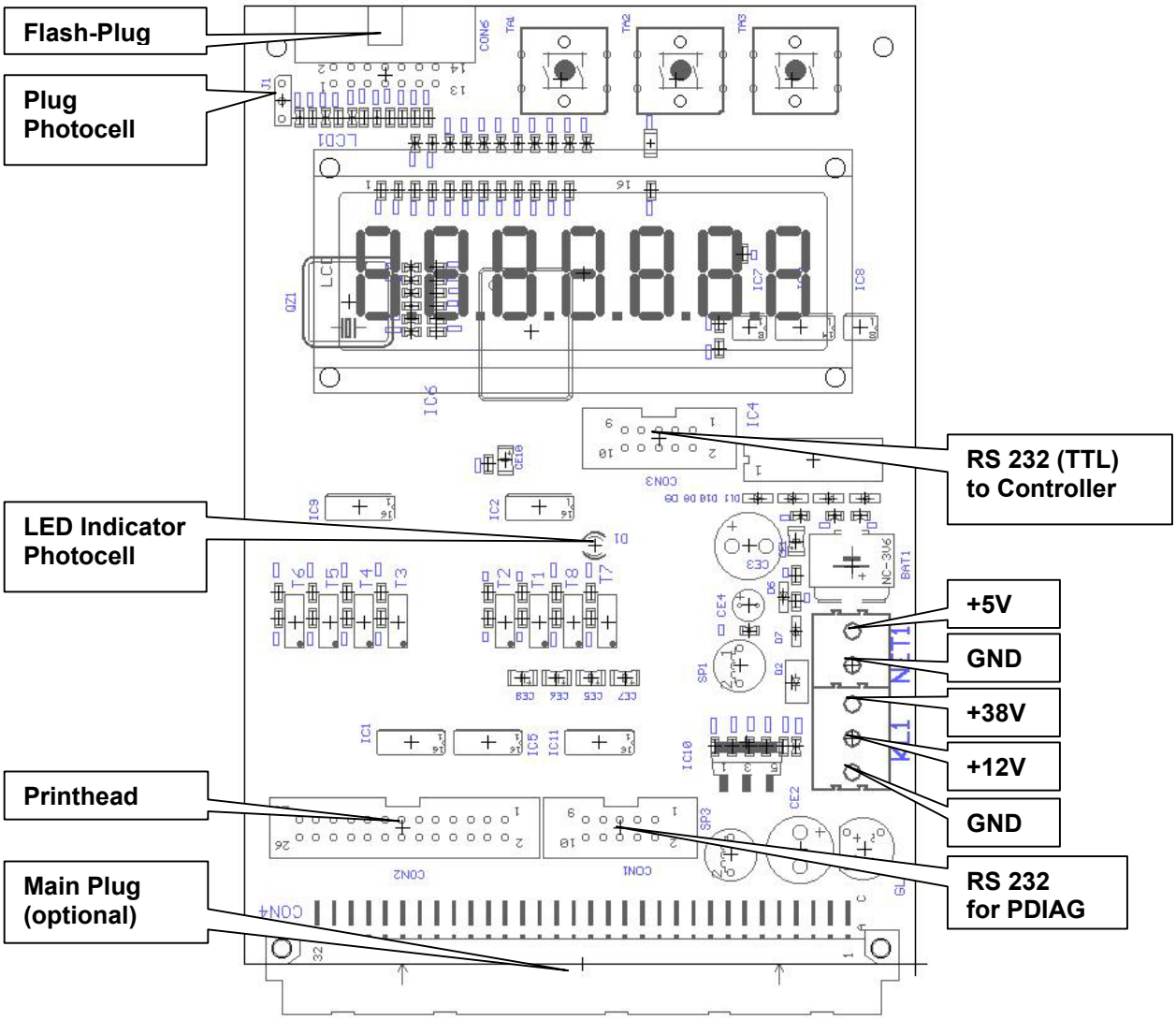
The power supply unit supplies the +5V current for the processor and logic. Current for the print head (+12V) and for the jet control (+38V) is supplied by the I/O-Board. This board also carries the serial interface to the controller.

A LED indicates the status of the photo cell that initiates printing.

The controller ensures that the processor board adjusts printing to the various paper transport speeds depending on the resolution selected. This means adjusting the timing of the print delay (travel time from photo cell to print head) and the print density (time between two pixel lines).

A small operator panel on the processor board allows certain settings to be made manually by using three buttons and the LED display. It is only necessary to make an adjustment here when changing print fonts.

The following picture shows the endorser processor board:



Parameters can be changed by using the PDIAG program. To achieve this the PC's COM1 or COM2 port is connected to the processor board's RS232 port and the PDIAG program started. Remove the 10-pin plug of the ribbon cable from the controller. To restore all settings to the original factory settings load the file INOTEC.EEP by pressing F5. Subsequently pressing F2 transferres these values to the endorser.

Caution: Only change the parameters described below!!!

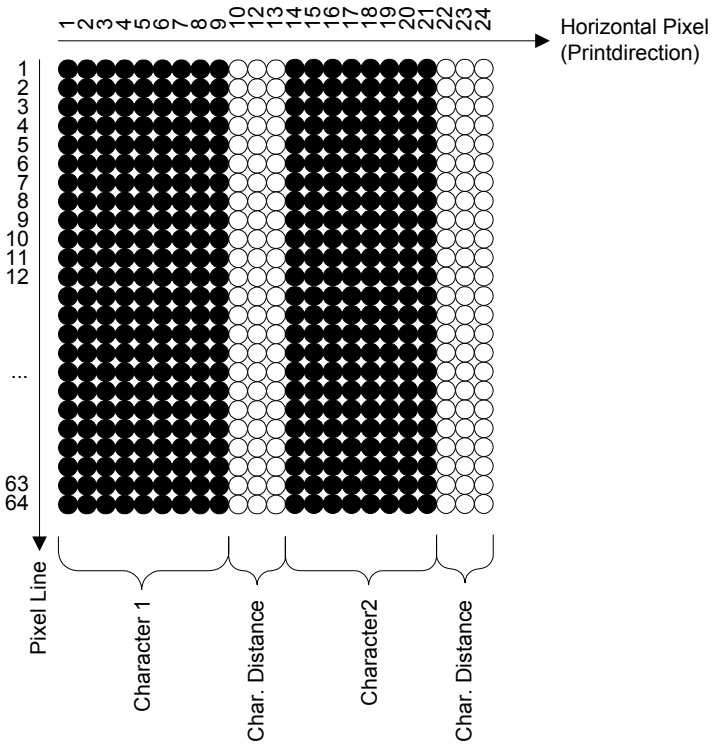
3.8.4 Endorser Settings

The inkjet cartridge employed is capable of printing 64 pixels simultaneously. These 64 pixels are aligned in one line. As the paper is transported through the scanner the print head prints line by line, which generates the character to be displayed. Line advance is controlled by the paper transport speed of the scanner.

Resolution of a line is 360 dpi. This results in a character height of 4.5 mm at 64 pixels.

The parameters that can change the typeface in the horizontal direction are described in the following.

The operator prompts will be in German on older scanners. The respective texts are shown in parenthesis.



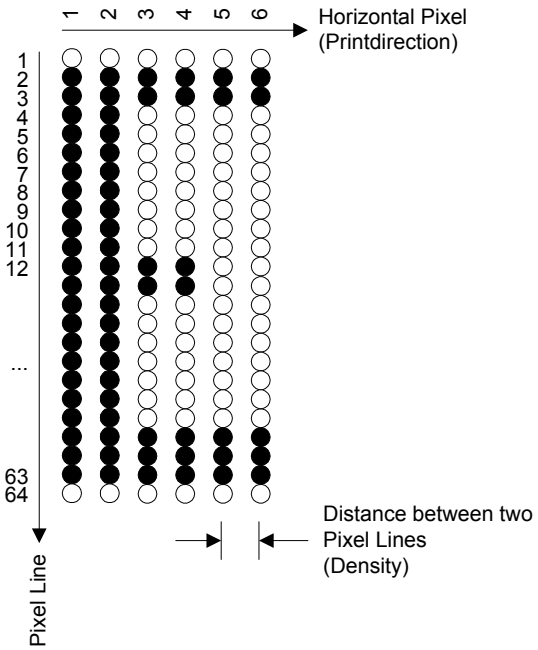
3.8.4.1 Print Density for Text/Barcodes (Druckdichte/BcDichte%)

The print density determines the distance between two pixel lines. However, this distance is also influenced by the paper transport speed of the scanner.

To ensure that the print image is always the same regardless of paper transport speed (various resolutions) the controller sets the print density according to the resolution selected. Changing this value is only possible on a temporary basis.

Print density for barcodes, however, can be set as a percentage of text density. At 150% the bars and spaces are half as wide again as at 100%. Naturally the distance between pixel lines increases as well.

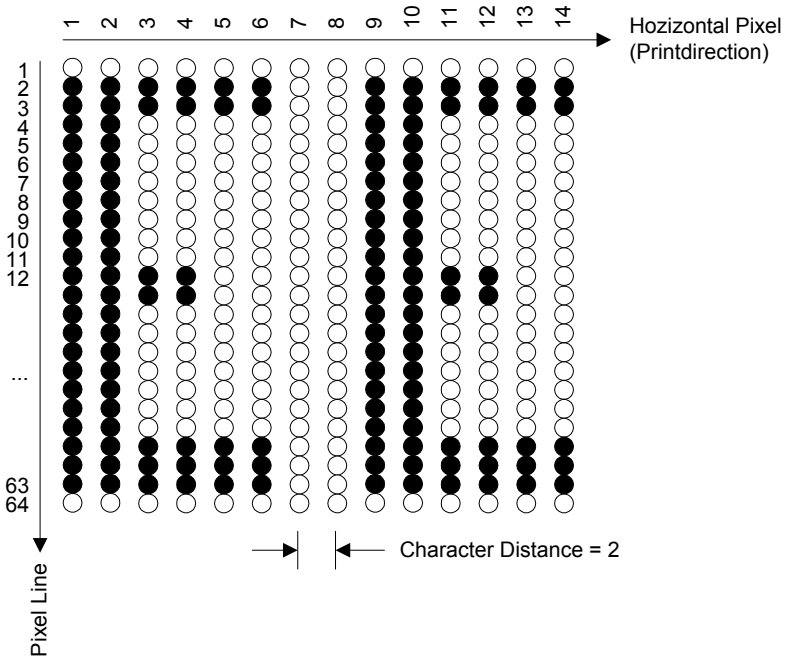
Caution: Settings below 100% have no effect at a scan resolution of 200 dpi.



Default value barcode: **100%**
value text: **set by controller**

3.8.4.2 Character Distance (CharAbstand)

A character string with very small spaces between characters is hard to read. Therefore, a character distance has been implemented, which is achieved by inserting 'blank pixel lines'. Blank lines can be inserted within certain limits to improve the character display.



Value limits for character distance: 01 to 10
Default value: 3

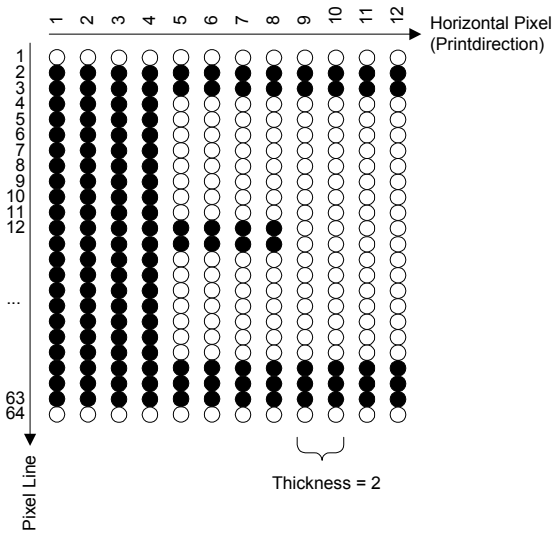
3.8.4.3 Thickness for Text/Barcodes (Fettdruck/BcFettdruck)

The last possibility to influence the print image is the parameter Thickness (Print Bold). The thickness value sets the number of 'pixel line repeats'.

Increasing this parameter setting causes a fatter print.

The minimum number of pixel lines printed for a vertical line is:
Thickness x 2

Thickness for text and barcodes is handled separately by the endorser.



Value limits for print bold: 01 to 05
Default value text: 1
Default value barcode: 2

3.8.4.4 Barcode Lines Ratio (BcBalkenVerh.)

Sets the relationship of narrow and wide barcode lines as well as the spaces between them. For example if a relationship of 1:3 is desired the value has to be set to 6 (2:6 = 1:3).

Value limits barcode lines: 3 to 8
Default value: 5 (1 : 2.5)

3.8.4.5 Endorser Counter (PagiNummerH/L)

The endorser has an integral eight-position counter that is automatically incremented **after each** print cycle. The counter contents can be part of the character string printed on each document. When the counter reaches 99999999 it is automatically reset to 00000000.

Normally the counter is set by the scan software or the SCSI driver, but it can also be set via the menu.

3.8.4.6 Time & Date (Zeit Datum)

The endorser is fitted with a real time clock. The current time and/or date can be part of the character string to be printed. Normally the real time clock is synchronised to the PC's system time by the scan software. But it can also be set via the menu.

3.8.4.7 Print Position Time (KopfStbyZeit)

If the print head is in the print position and no printing takes place within the time set (in secs.) it is automatically returned to the standby position to prevent drying out of the jets.

If the value is set to zero no automatic return to the standby position takes place.

Value limits for print position time: 0 to 9999[s]
Default value: 60[s]

3.8.4.8 Cleaning the Print Head (Kopfreinigung)

After prolonged use of an inkjet cartridge it is possible that individual jets appear to 'fade'. To correct that condition the endorser has an inbuilt function 'clean print head'. This process addresses all available jets, which usually removes minor soiling and clogging.

This function is also initiated every time the scanner is turned on.

CAUTION: Execution of this function causes a lot of ink to be ejected from the cartridge.

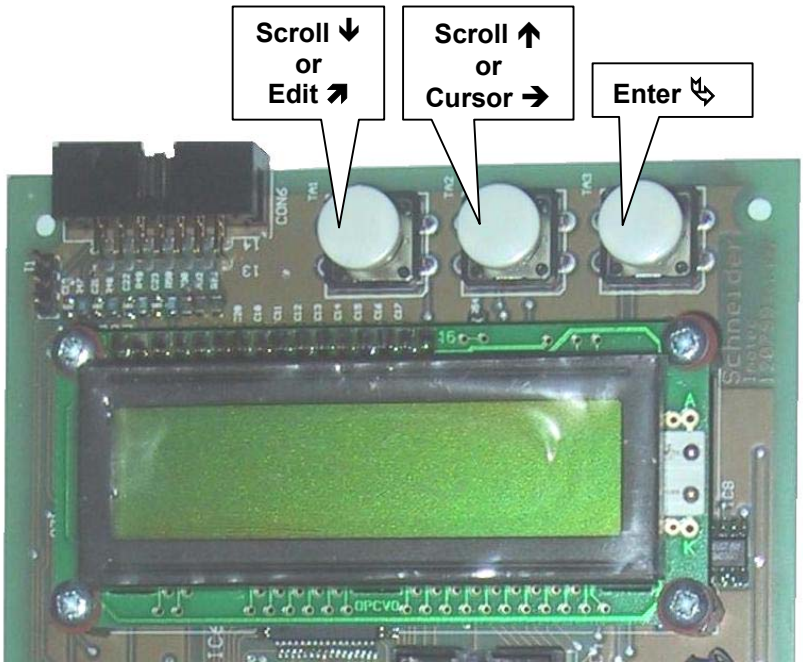
3.8.4.9 Print Head Voltage (InkHead Spng)

Different voltages can power the inkjet cartridge jets. Increasing print head voltage causes more ink to be ejected during the print process.

Value	Jet Voltage
0	24.8V
1	25.2V
2	27.0V
Default 3	28.0V

3.8.5 Change Endorser Settings

The endorser has a single line display with background lighting. It can display a maximum of sixteen characters. Using the three push buttons the user is guided through the menu. The following picture shows the functions of the three buttons.

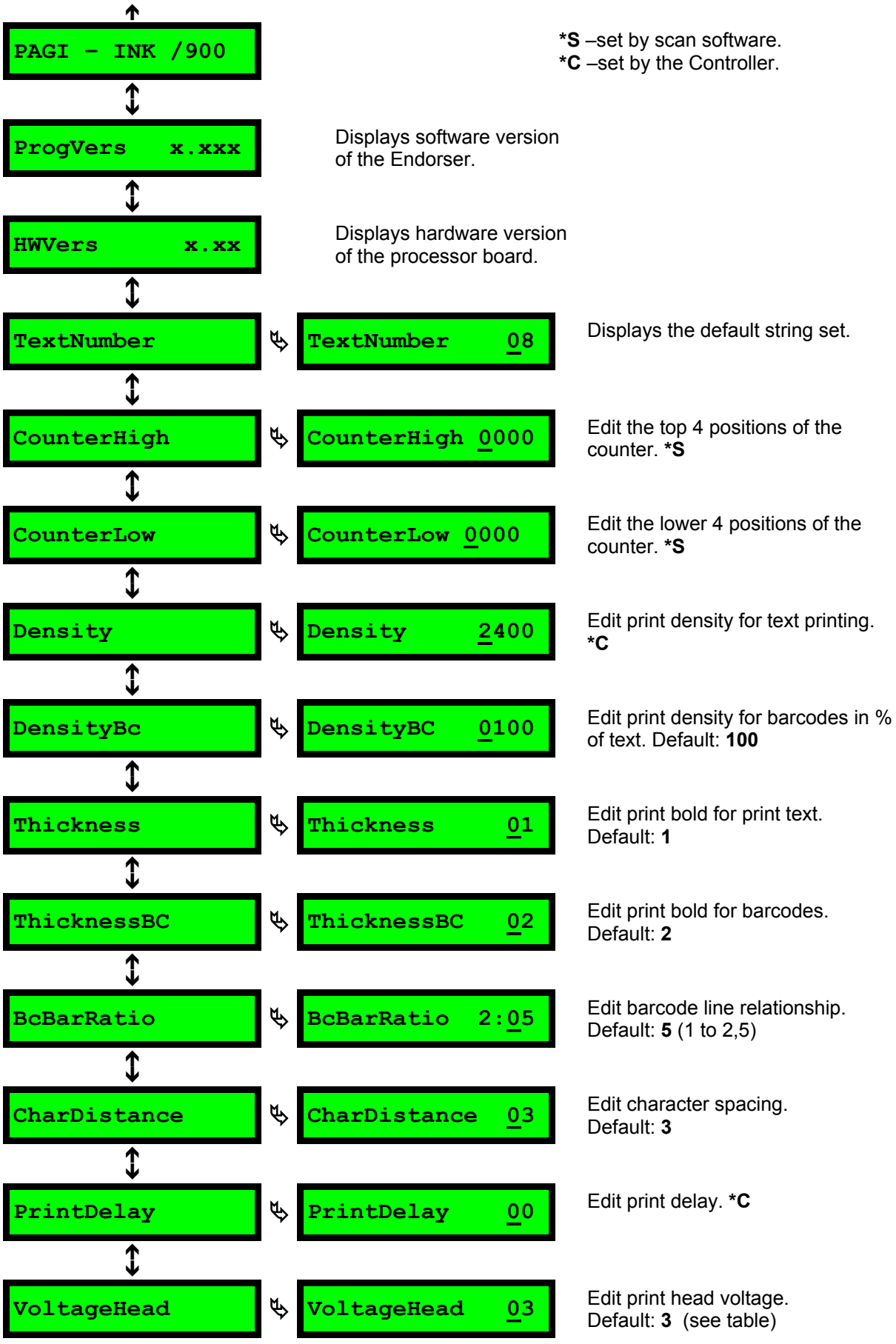


Scrolling through the menu is accomplished downwards ↓ by the left button and upwards ↑ by the middle button.

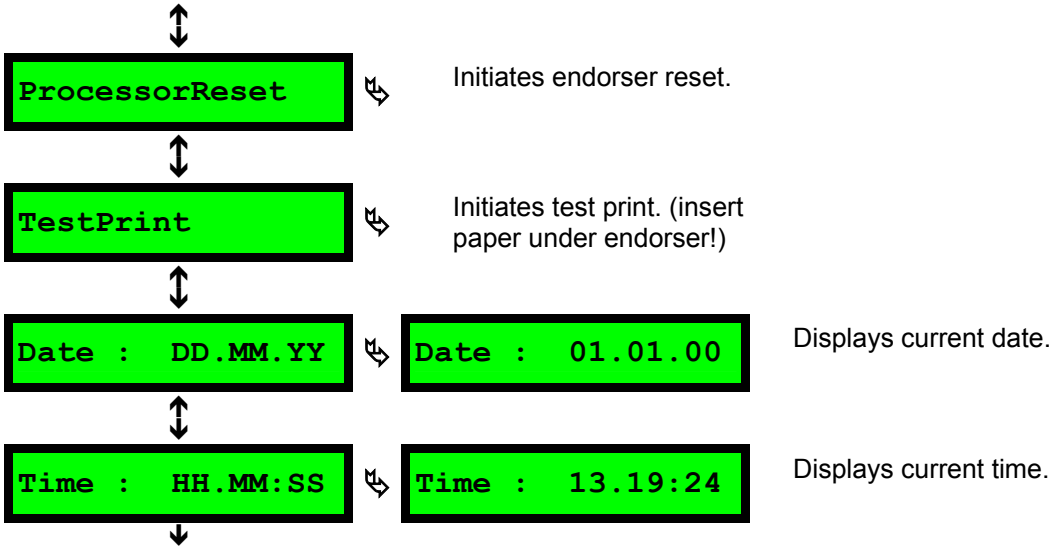
The Enter key displays the menu item selected.

If the value displayed can be edited use the middle button → to position the cursor on the position to be changed. Use the left button ↗ to increase the value by one per push. When all positions desired have been edited confirm the changes by pressing the Enter button.

To save the changes to the EEPROM menu item **<SaveSetup> (<SetUp speichern>)** must be selected.

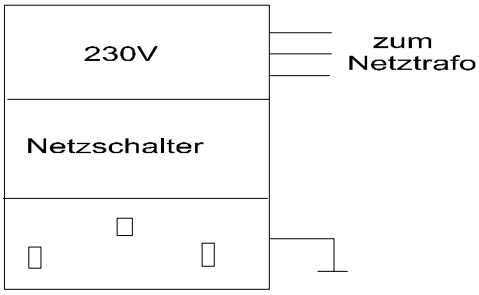

PAGI - INK /900
*S –set by scan software.
*C –set by the Controller.
ProgVers x.xxx
Displays software version of the Endorser.
HWVers x.xx
Displays hardware version of the processor board.
TextNumber
TextNumber 08
Displays the default string set.
CounterHigh
CounterHigh 0000
Edit the top 4 positions of the counter. *S
CounterLow
CounterLow 0000
Edit the lower 4 positions of the counter. *S
Density
Density 2400
Edit print density for text printing. *C
DensityBc
DensityBC 0100
Edit print density for barcodes in % of text. Default: 100
Thickness
Thickness 01
Edit print bold for print text. Default: 1
ThicknessBC
ThicknessBC 02
Edit print bold for barcodes. Default: 2
BcBarRatio
BcBarRatio 2:05
Edit barcode line relationship. Default: 5 (1 to 2,5)
CharDistance
CharDistance 03
Edit character spacing. Default: 3
PrintDelay
PrintDelay 00
Edit print delay. *C
VoltageHead
VoltageHead 03
Edit print head voltage. Default: 3 (see table)


PrintPos
Drives print head into print position.
StandbyPos
Drives print head into standby position.
PrtPosTime
PrtPosTime 0060
Edit time print head stays in print position. Default: 60 s
MoveTime
MoveTime 99
Displays time set in ms for moving print head.
Config1
Config1 11000000
Displays config. byte 1
Config2
Config2 00000000
Displays config. byte 2
Config3
Config3 00000000
Displays config. byte 3
Config4
Config4 00000000
Displays config. byte 4
SaveSetup
Saves all data changed via the menu to the EEP and initiates an endorser reset.
Time (HHMM)
Time (HHMM) 0000
Edit current time *S
Date (DDMM)
Date (DDMM) 0000
Edit current date *S
Year (YYYY)
Year (YYYY) 0000
Edit current year *S
InputsView
Inputs: 00000000
Displays logic state of all inputs.
CleanHead
Initiates head cleaning routine.



3.9 Power Supply

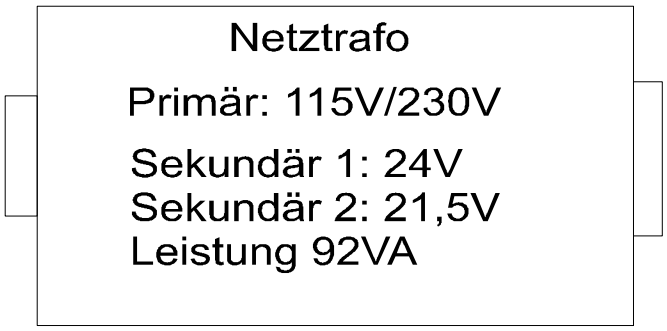
3.9.1 Mains Power Switch Unit



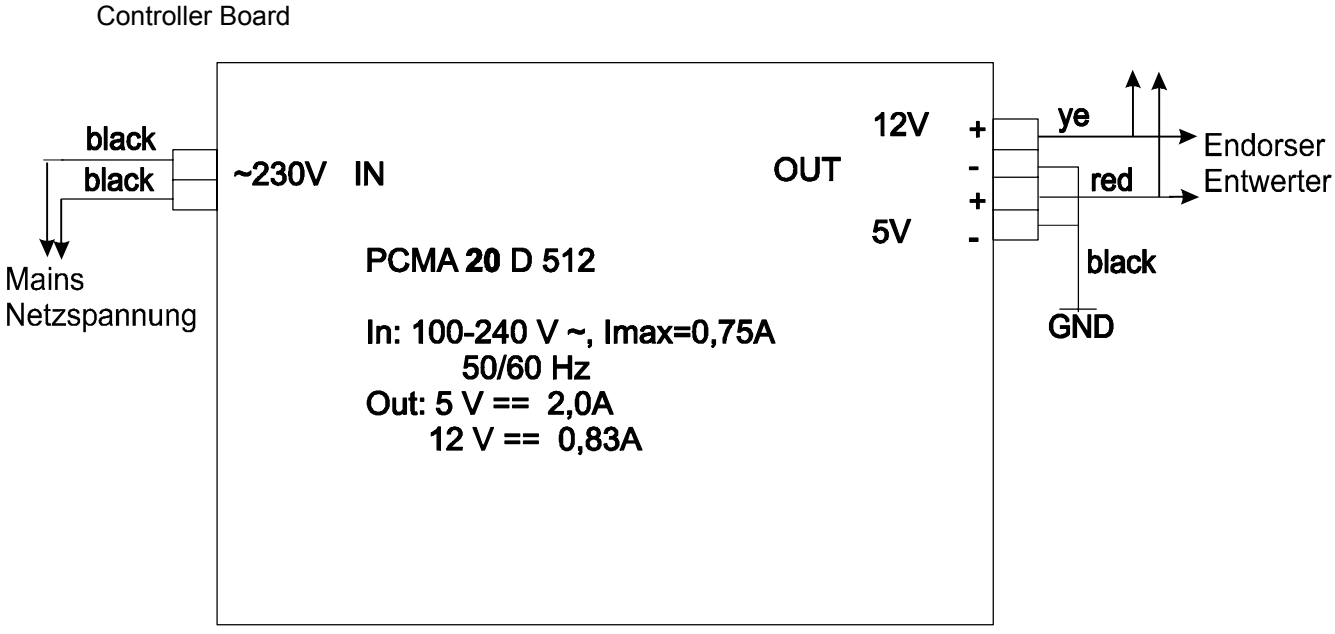
The mains power switch unit contains:
A ceramic housing with two fuses T 3.15A/250V, ∅5X20mm, suitable for both 230V and 115V mains voltage. The ceramic housing has several electrical contacts and can be inserted in two positions. Each position displays either 230V or 115V.
The ceramic housing can be removed by using a screwdriver.
a LC system filter
a mains switch
a connection for the power cord
an elastic plastic covering that guards against touching live parts. This is particularly important when adjusting the back camera.
Changing mains voltage prior to first time use and changing fuses is described in the operating instructions.

3.9.2 Mains Transformer

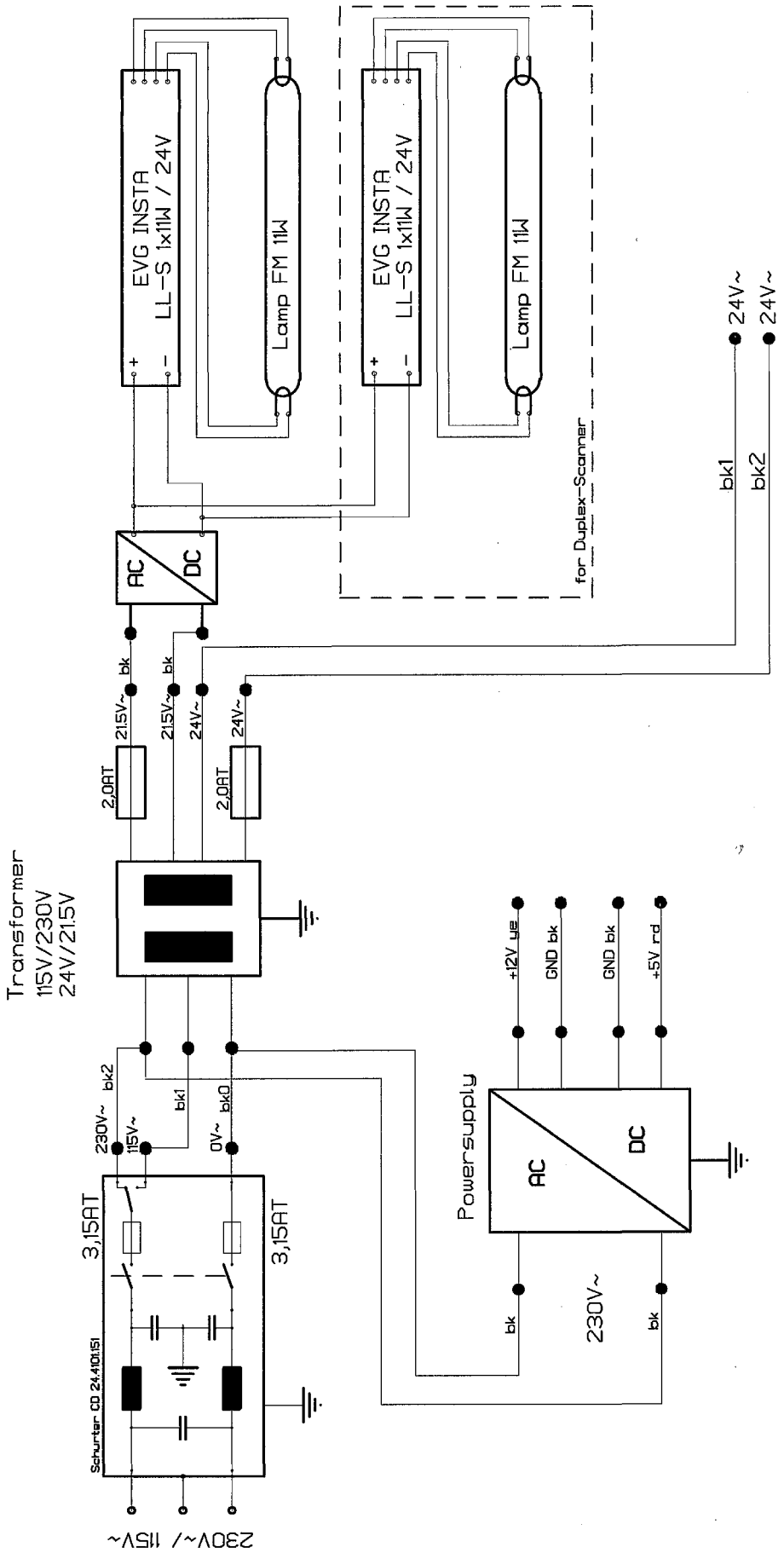
Mains power for the mains power supply is branched off before the mains transformer.
Both secondary power circuits of the mains transformer are protected by to fuses with a rating of 2A T.
One secondary power circuit supplies the two fluorescent lamps with 21,5 V AC. The other supplies 24 V AC to the I/O board, which generates other voltages locally.



3.9.3 Switching Power Supply



As can be seen from the drawing above, the power supply unit receives a mains supply of ~230V as input. Output is both +5V und +12V. These voltages power the following boards:
Controller Board
Two DT plus Boards
SCSI Board, if present
Endorser processor board with +5V.


EVG INSTA
LL-S 1x11W / 24V
Lamp FM 11W
EVG INSTA
LL-S 1x11W / 24V
Lamp FM 11W
for Duplex-Scanner
24V~
24V~
bk1
bk2
AC
DC
bk
bk
21.5V~
21.5V~
24V~
24V~
2,0AT
2,0AT
Transformer
115V/230V
24V/21.5V
+12V ye
GND bk
GND bk
+5V rd
Powersupply
AC
DC
230V~ bk2
115V~
bk1
0V~ bk0
3,15AT
3,15AT
Schurter CD 24.4101.151
bk
230V~
bk
230V~/ 115V~

3.10 Lamp Unit

The power supply circuit diagram also shows the power circuit for the lamp unit. It consists of the following parts:

3.10.1 Rectifier Board

A small board with rectifier bridge and filter capacitor. Power input is 21.5V AC from the mains power transformer. Output is +24V DC that is supplied to the electronic ballast of the fluorescent lamp/s.

3.10.2 Electronic Lamp Ballasts

The SCAMAX 2600/4000 has one or two (simplex or duplex) electronic ballasts of the type: EVG INSTALL-S 1x11W / 24V, one for each fluorescent tube.

These ballasts cause lamp saving start (pre-heating) and ensure optimum life span of the lamps. Lamp malfunctions (short, end-of-life, excessive voltage, idling, glass breakage, quasi-rectifier operation, spiral break when switching on and during operation) are recognised by the ballast and are rectified or cause shutdown. In the case the scanner has to be powered down and the fluorescent tubes have to be replaced.
Voltage in the lamp circuit is 230 V.

3.10.3 Fluorescent Lamps

Two miniature fluorescent tubes with a diameter of 7 mm and 11 W rated output are used. Each tube is supplied with its own power by a ballast unit. One tube illuminates the front of documents and the second, optional, tube illuminates the back.

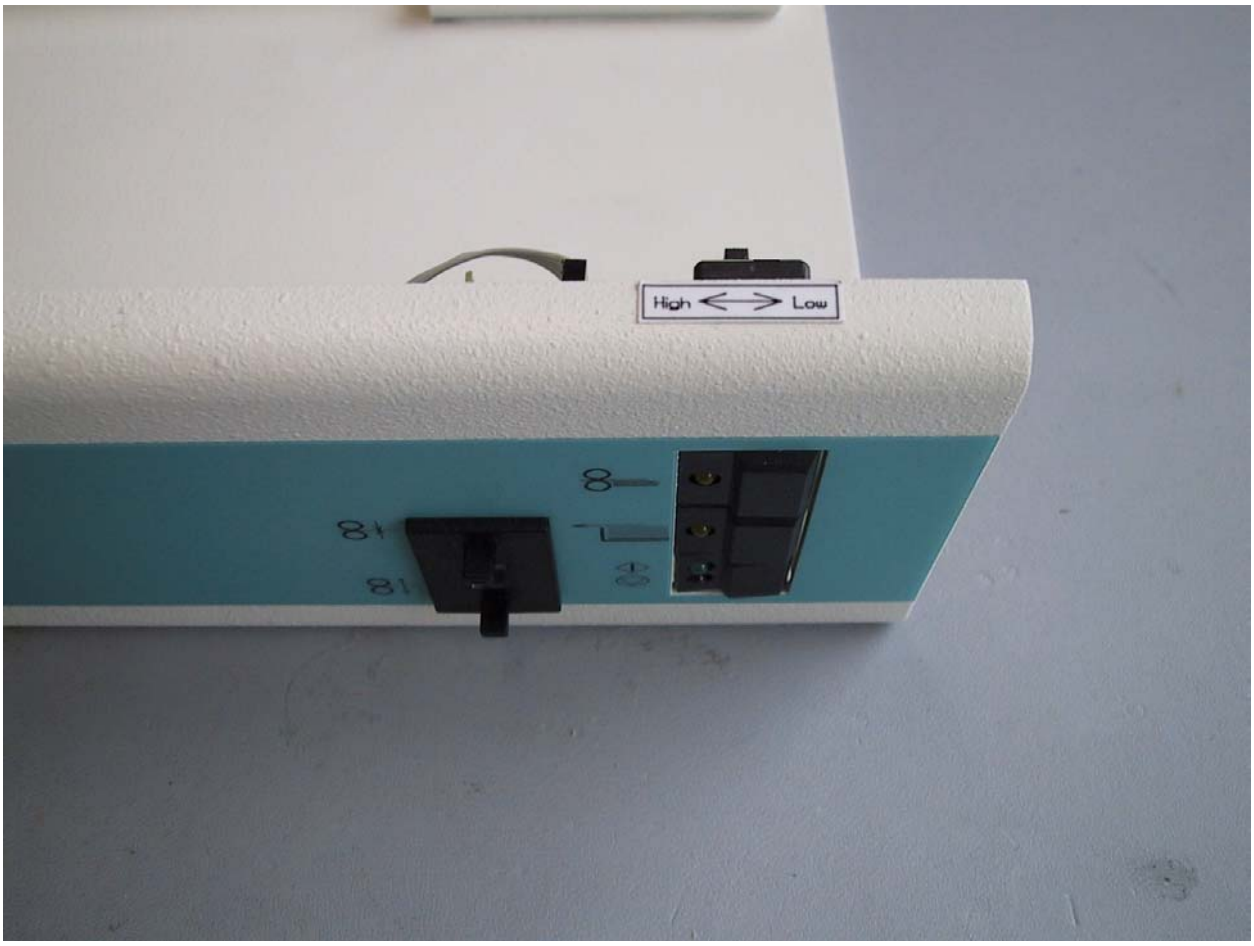
The tubes have contact pins at their ends that are inserted into spring loaded lamp holders by turning the tubes on their axis. The two lamp holders are connected by a load-bearing piece of sheet metal that also shields against unwanted light upwards and downwards as appropriate.

3.11 Operator Panel

The operator panel contains three push button switches with one or two integrated LED's and one BCD-switch.

The push button switches are soldered onto a circuit board, which is mounted behind the front panel. The BCD-switch is of the snap-in type. It is connected to the circuit board via a plug and cable.

In addition the circuit board has a two position switch (HI/LOW), which is used for various service settings.
The circuit board is connected to the I/O board via a ribbon cable. Static signals of a 5V TTL-level are transmitted.



The initial feed belts and the separator rollers cover wear over a period of time. This results in the distance between feed belts and separator rollers becoming ever greater. The setting on the BCD-switch has to be decreased to compensate for the wear and tear. When a setting of '0' has been reached the switch on the circuit board has to be changed from HIGH (factory setting) to LOW and a machine reset has to be executed (switch scanner off, then on). The previous setting of '0' corresponds now to a setting of '5'.

The HIGH/LOW switch also activates the following service routines; some of them are described in the User Manual. Selection of the service routine is via the BCD-switch and initiation of the routine is via the push buttons (see User Manual, for example white calibration):

BCD-value 9: **White Calibration** (see User Manual).
BCD-value 8: **Calibrating the Optical Double Feed Detector** (SCAMAX 2500 only).
BCD-value 7: **Cleaning Routine** (see User Manual).
BCD-value 6: **Test Scan Routine**. Facilitates testing of the mechanical functions of the Scanner without the need for a PC to be connected to it.
The PC's control functions are simulated in the controller and any errors Are indicated by the red LED in the start switch being illuminated.

3.12 Optical Components Unit

The optical components unit covers the light path of the front camera and the same for the back camera if fitted.
Components for both paths and their mode of operation are identical. Merely their positioning in the scanner is different.
Each path consists of:
a small mirror
a large mirror
a lens 3,5/50 mm with colour filter (bitonal) or 6,4/60 mm (colour).
As can be seen from the drawing each path is broken by two mirrors to keep outside dimensions of the scanner as small as possible.

In a SCAMAX 2600/4000 duplex version the two miniature fluorescent tubes are held at each end by a spring-loaded lamp housing. The two lamp holders are connected by a piece of sheet metal that also prevents unwanted light emission upwards or downwards as appropriate.

The two tubes are somewhat offset and illuminate the front and back respectively of the document being transported. The light reflected from the document contains the image information. It falls onto the smaller mirror (1). This mirror transmits the light to the larger mirror (2) (angle of incidence = reflection angle), which reflects it to the lens. The light captured by the lens is condensed onto the CCD array.

Since the document moves line by line between the two tubes image information is transmitted to the CCD array of each camera on a line-by-line basis.

The start of the scan process must be exactly timed to be in sync with the feeding of the document. Since there is no photocell to detect the leading edge of the paper the detection of a certain amount of light in the CCD is used to signal 'leading edge of paper' (see also 'Flow of a normal scan process').

3.13 Paper Transport

The paper transport unit facilitates document input, followed by initial feed, transport, re-direction and final output of documents.
The unit has the following components:
Input hopper with drive motor
Paper feed with separation mechanism
Two rubber roller pairs
Paper output path
Output hopper
Drive mechanism with stepper motor

3.13.1 Input Hopper with Drive Motor

The input hopper is designed to allow both single sheet feed as well stack processing. Its operation is described in the operating instructions.

The input hopper plate is driven up/down by a DC motor with gearbox and eccentric cam discs attached on the right and left hand sides.

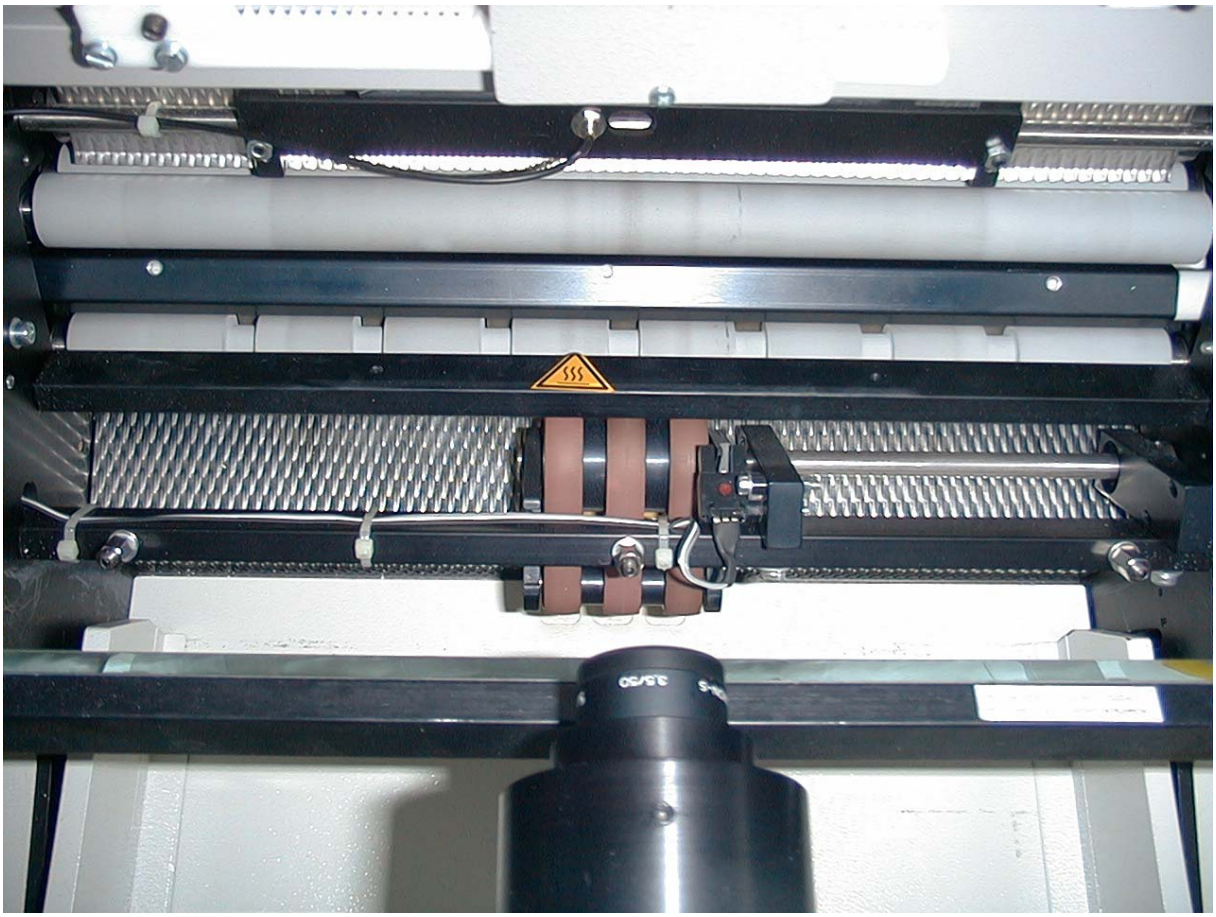
The following switches and sensors control the motor:
1) Switch „Stack mode/Single sheet feed“
2) Switch „Start/Stop“
3) Paper sensor in the input hopper plate
4) Forked photocell at the bearing lever of the initial feed rollers
5) Microswitch - upper limit of input hopper plate
6) Microswitch – lower limit of input hopper plate

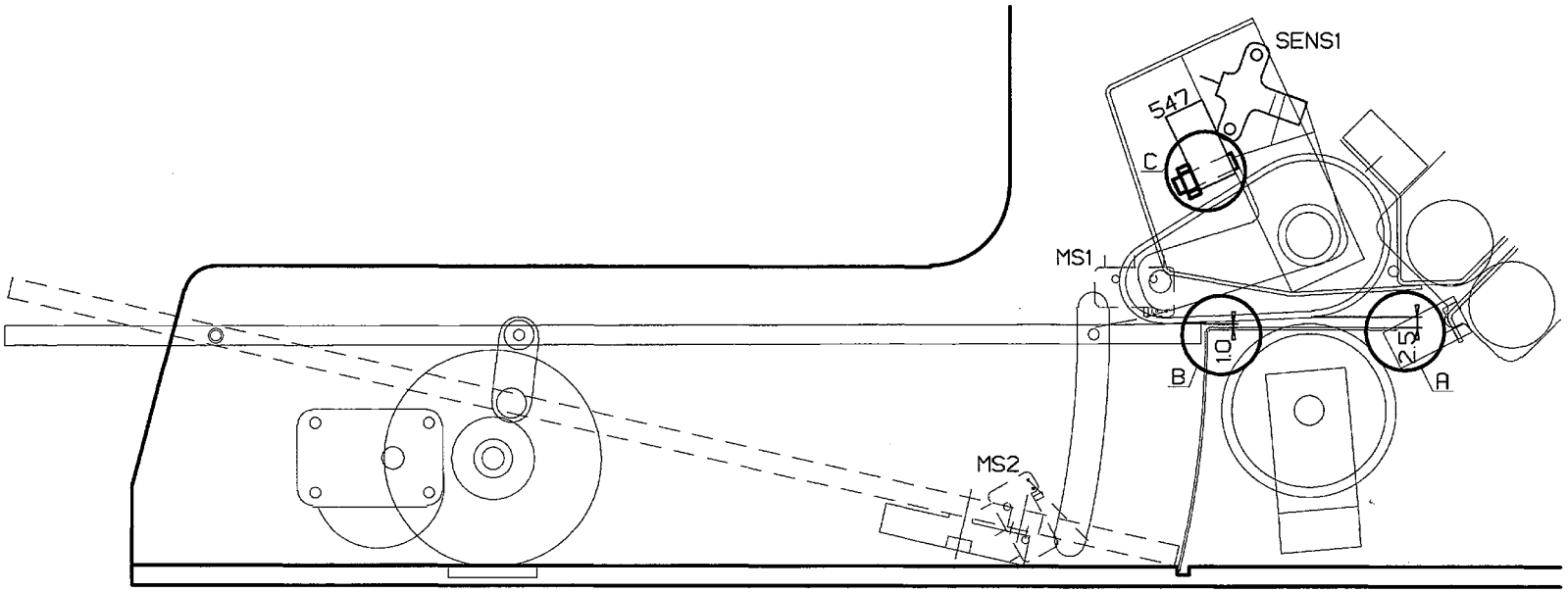
The I/O board will send a command to the lift motor in three circumstances (Motor is running):

1) The switch „Stack mode/Single sheet feed“ is off (single sheet feed). The motor drive the plate upwards till its pin triggers the top microswitch. Lifting the initial feed rollers, which triggers the forked photocell (LED is lit) also stops the motor.

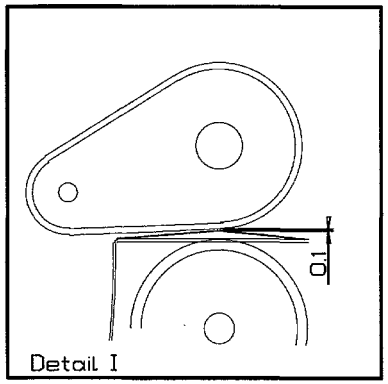
2) The switch „Stack mode/Single sheet feed“ is on (stack mode), the "Start/Stop" switch is on (Start: LED green) and the paper sensor detects one document. The motor will run till the forked photocell is activated.

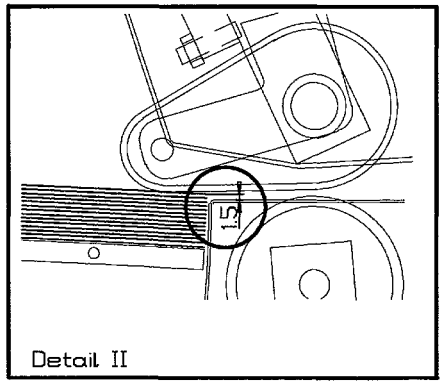
3) The switch „Stack mode/Single sheet feed“ is on (stack mode) and the paper sensor detects no document (end of stack). The motor will run till the lower microswitch is activated. Again, if the initial feed rollers are lifted the motor will stop.





Check	Adjust
1. Measure "A"	Move strip 547 within drill hole in sidewalls
2. Guide plate conture (Detail I)	
3. Measure "B" (Paper Separation OFF)	Bend microswitch lever "MS1"
4. Measure stack height (Detail II) use template if necessary	Adjust forked photocell (SENS1)
5. Last sheet has been pulled in?	Set height of initiale feed roller via adjustment screw "C" (don't set too low!)





I512/19.02.2001/SCH

Document Feeder Adjustment SCAMAX 2600/4000

InoTec Organisationssysteme GmbH

3.13.2 Diagnosing Paper Input Hopper Faults

Various errors can occur with the paper input hopper. The next three chapters describe these errors and offer methodologies for diagnosing them.

3.13.2.1 General Faults

Faults described in this section can occur regardless of switch settings on the scanner, as well as with both GAL versions. The difference between the two GAL versions (2.2 and 2.3) is that version 2.3 checks the top microswitch as well as the slotted opto-switch. This has been implemented to ensure that the last document of a batch has been pulled in.

Abreviations used:

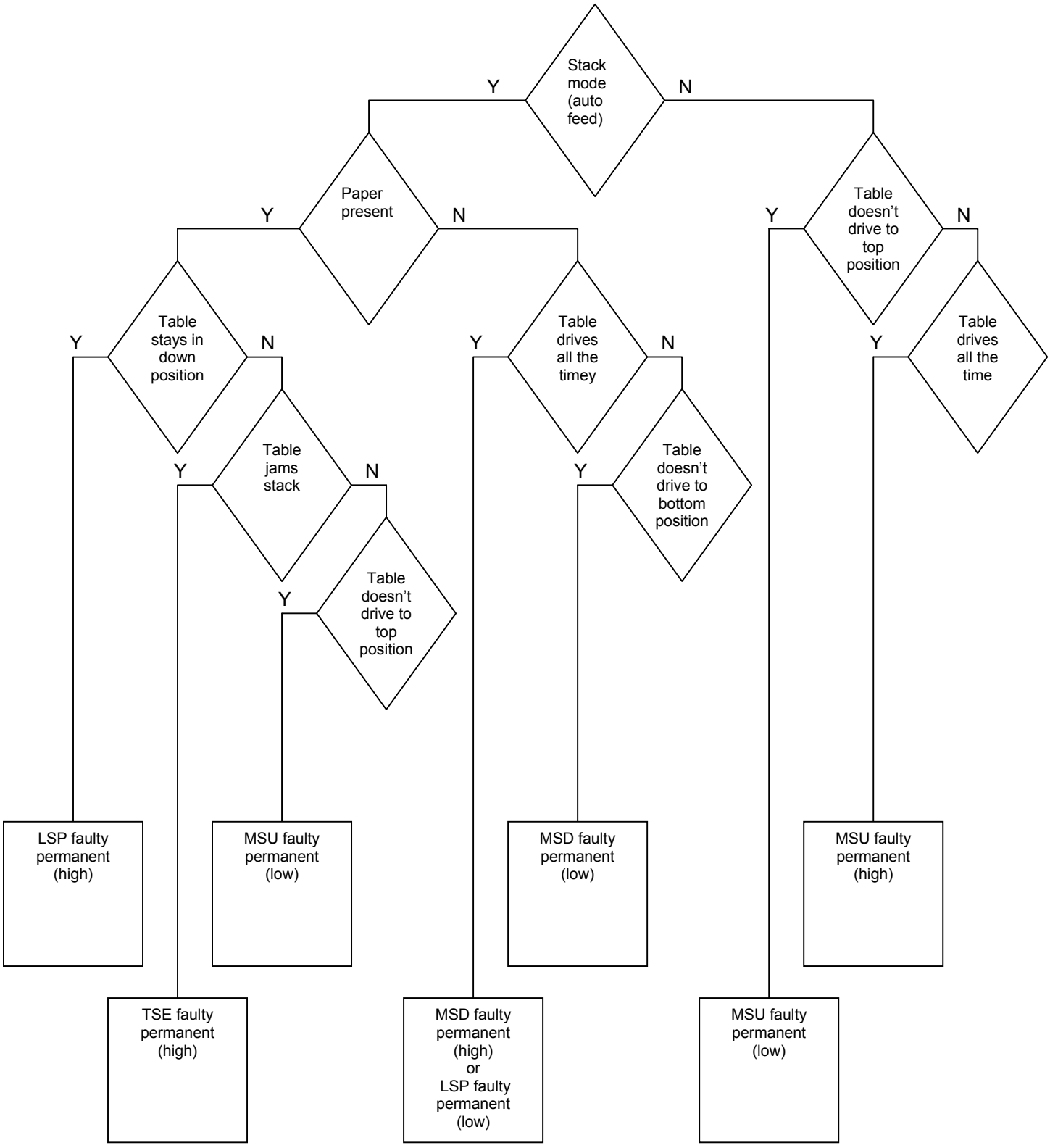
TSE: Table SEnsor (slotted opto-switch at feed belts)
LSP: LightSensorPaper (input hopper plate proximity switch)
MSD: MicroSwitchDown (microswitch position down)
MSU: MicroSwitchUp (microswitch poistion top)

The most common cause of microswitch faults is that its lever is bent. This will prevent the switch from being activated.

Fault	Cause
Table does not drive	Defective TSE permanent (low), motor defective; faulty lead; fault on I/O: stabiliser IC5, IC6; capacitors C8-C11; Z-Diode DZ1; ULN2803A IC7
Motor runs, table stationary	Drive shaft's or motor's gear wheel loose; motor mounting not fastened properly
Table falls down	Motor and/or drive shaft gear wheels loose

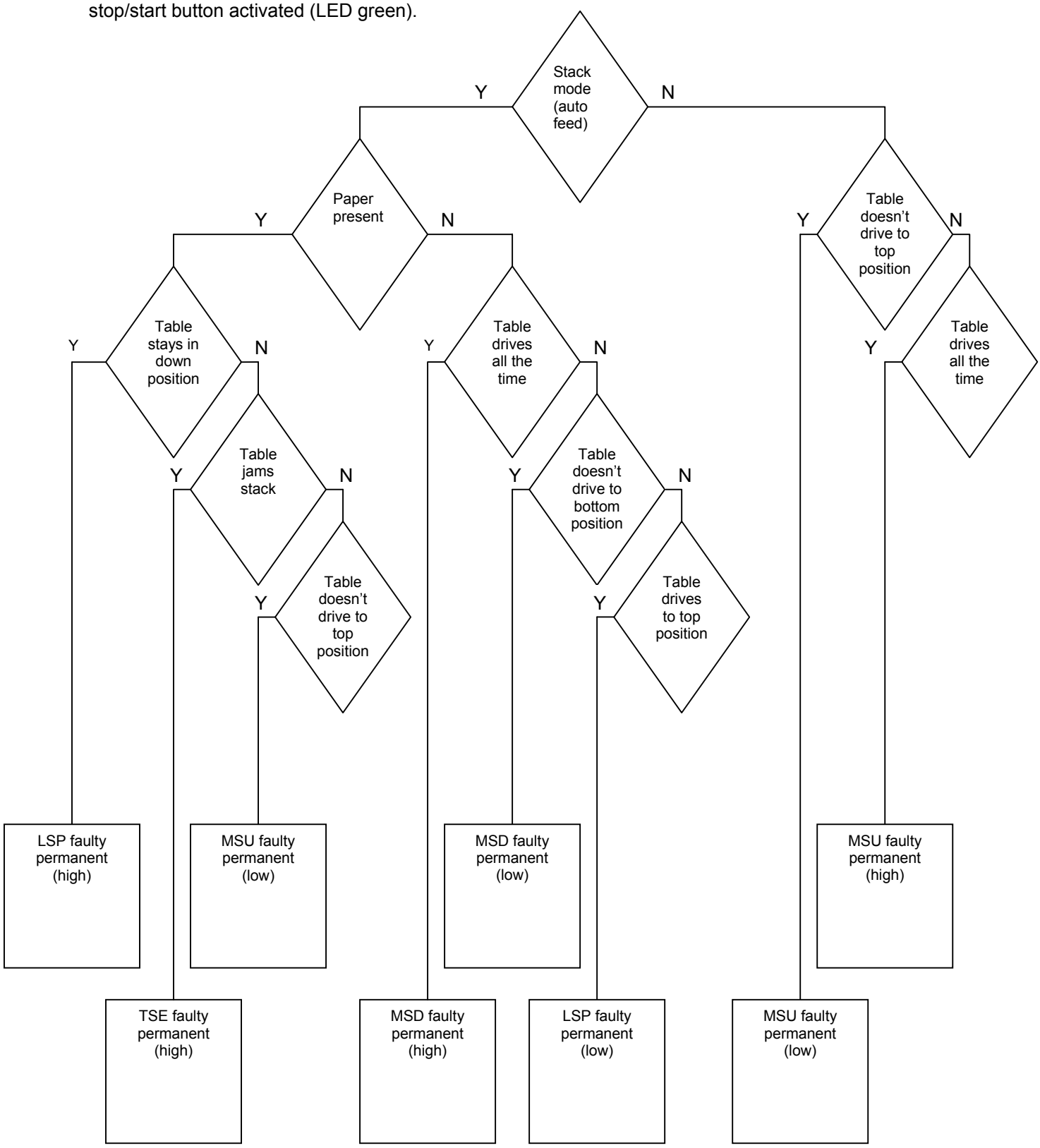
3.13.2.2 Condition dependent Faults with GAL 2.2

To employ the following flow diagram for fault diagnostics the scanner must be switched on and the stop/start button activated (LED green).



3.13.2.3 Condition dependent Faults with GAL 2.3

To employ the following flow diagram for fault diagnostics the scanner must be switched on and the stop/start button activated (LED green).



3.13.3 Paper Feed with Separation System

The initial feed rollers, consisting of three red rubber belts, are mounted on two levers. Its own weight presses it onto the top document.

The lowest position of the initial feed rollers can be adjusted vertically via two set-screws (see above "Document Feeder Adjustment"). This adjustment is necessary to prevent the feed belts rubbing directly on the input hopper plate when no paper is present.

Paper feed is activated via an electromagnetic clutch located at the end of the shaft (see also "Flow of a scan routine"). Power transmission to the clutch is via a gear wheel. It is separated from the drive mechanism when the output hopper plate is lifted.

There are **normal feed rollers** made from aluminium and there are **heavy feed rollers** made from steel, which are approximately three times heavier. With difficult or unusual paper the heavier edition can improve paper feed due to the greater pressure being exerted.

The performance of the paper separation is largely dependent on many factors, but ultimately dictated by the slip and/or sticking together of documents. If heavier pressure produces better results with one kind of paper it may cause the opposite with another kind. The standard issue of aluminium rollers has been proven to be the best compromise available for the majority of documents encountered.

The pushback roller, which prevents two or more documents being fed simultaneously, plays an important part in paper separation. It is covered with a friction coating and its distance to the initial feed rollers can be adjusted depending on paper thickness. The pushback roller turns slowly against the paper travel direction. The main drive powers it via a round belt.

Normally the pushback rollers have **yellow friction coatings**. For documents difficult to separate there are **white friction coatings** available that offer greater traction that pushes paper back firmer. Life expectancy of the white covers is much shorter than for the yellow ones.

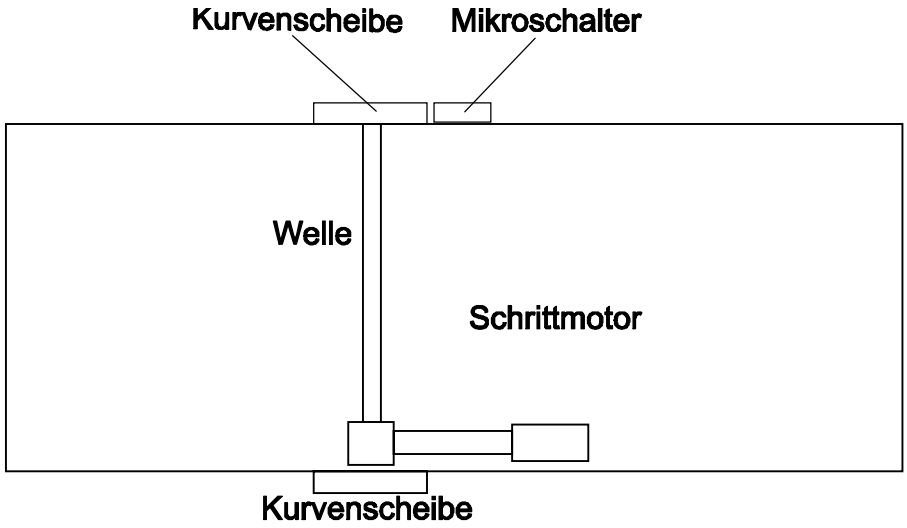
The paper thickness selector sets the distance between pushback roller and feed belts. A stepper motor drives two eccentric discs via a toothed belt and drive shaft. The discs hold the pushback roller, shaft and bearing in position against the pull of two springs.

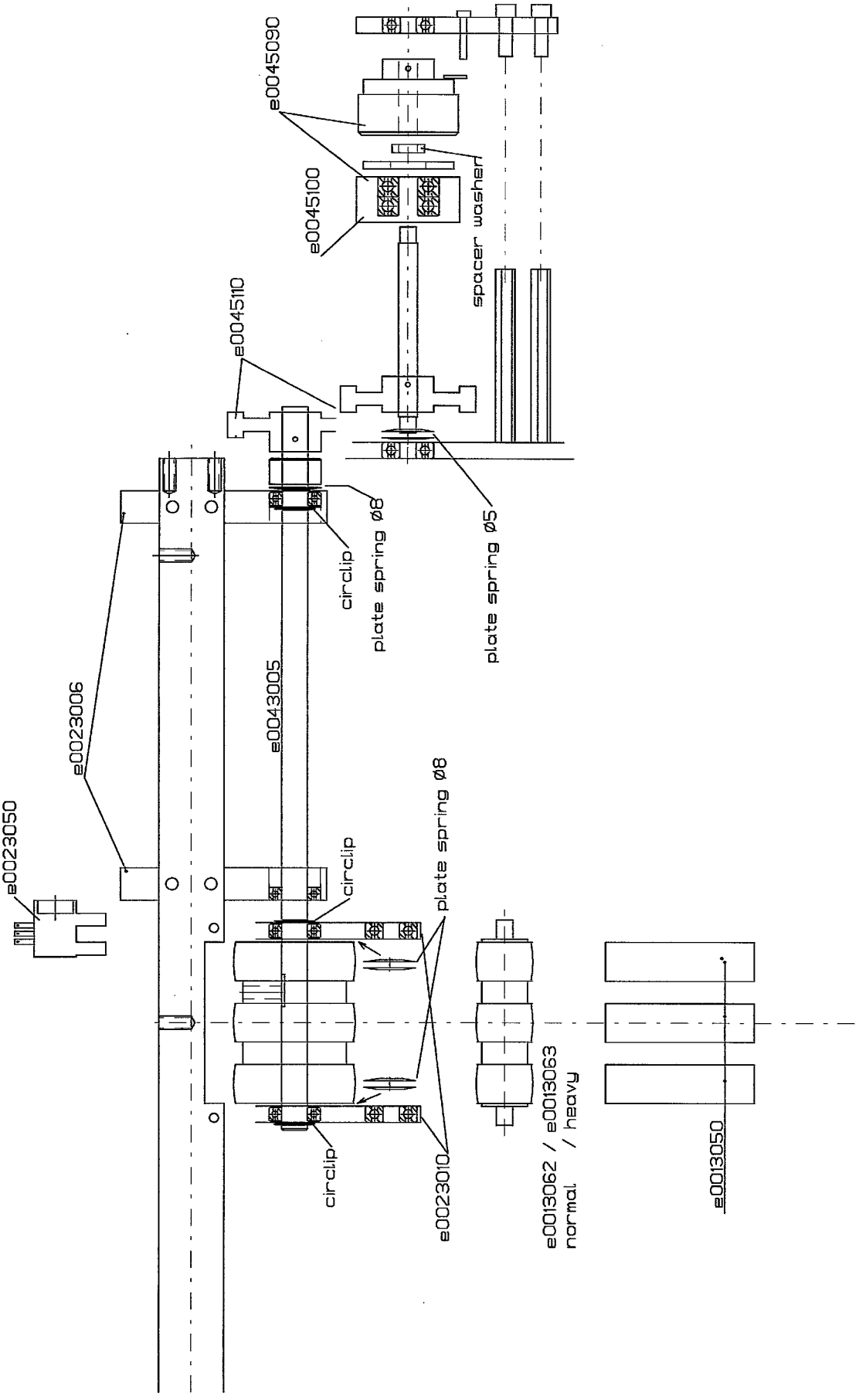
When the scanner is turned on, or after a reset, the stepper motor executes a reference drive whereby a nose on the left eccentric disc activates a microswitch. This position is also the position assumed when paper separation is off, i.e. it represents the largest distance between feed roller and pushback roller.

The paper thickness selector can be set to values between 0 and 9. The common setting for 80 gsm paper is '5'. To achieve this the entire adjustment area can be shifted in twelve steps via a parameter. This is necessary to allow for unavoidable manufacturing tolerances.

The two guide plates in the area of the separation mechanism float the documents to the first pair of rubber rollers. To ensure that even thin paper travels in the right direction the two guide plates, the top and bottom one have seven finger-like extensions at their ends. These extensions prevent thin paper wrapping itself around one of the rubber rollers.

Abstandseinstellung für S26/S40




e0045090
e0045100
spacer washer
e0045110
circlip
plate spring Ø8
plate spring Ø5
e0023006
e0043005
e0023050
circlip
plate spring Ø8
circlip
e0023010
e0013062 / e0013063
normal / heavy
e0013050

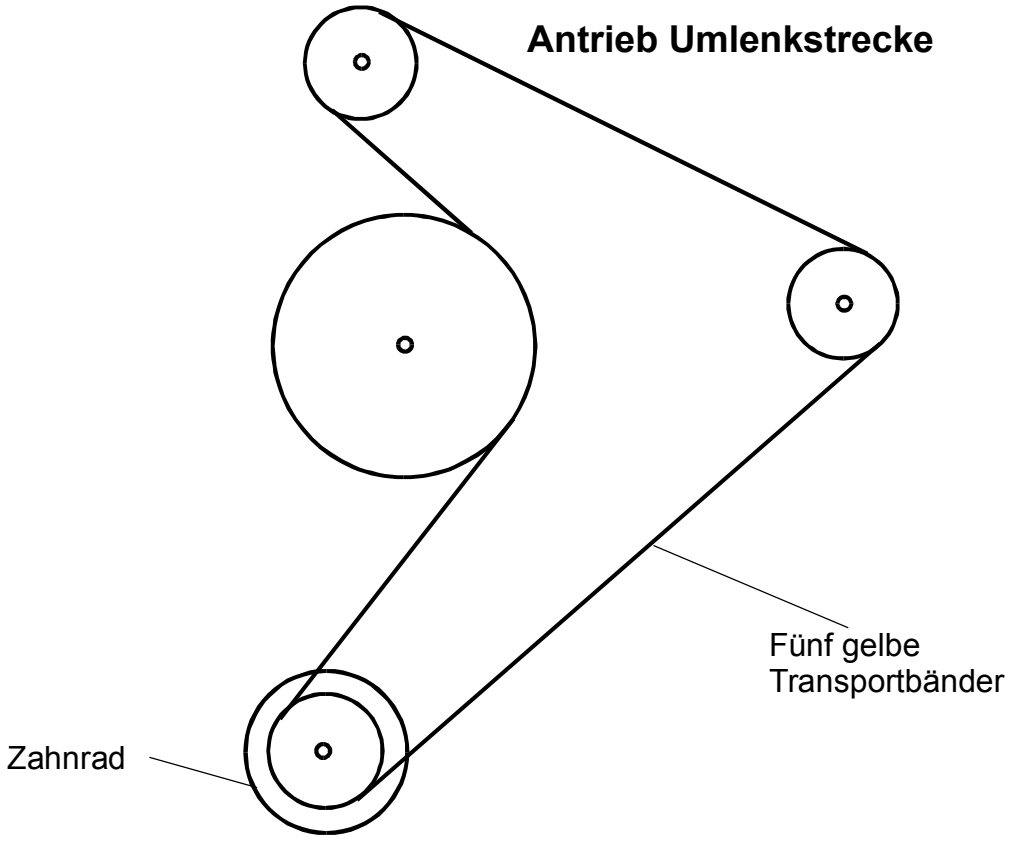
3.13.4 Rubber Roller Pairs (two)

There are two rubber roller pairs, one just prior to the two fluorescent tubes and another one behind the tubes.
The front rubber rollers each have seven cylindrical cut-outs that accommodate the seven finger extensions of the guide plates.
The rear rubber rollers have a cylindrical form.

The main drive belt drives the bottom roller only of each rubber roller pair. The top rollers are idlers, pressed against the bottom roller by two springs each.

In certain circumstances documents containing aggresive inks, coloured coatings or solvents like self-corbonising paper can cause problems.
These agents can cause swelling of the rubber rollers. For these situations special rubber rollers are available made from Viton, which is a relatively resistant material.

3.13.5 Paper Output Path



Power is transmitted from the main drive via a cogged-wheel to the lower roller. The five transport belts travel over the rear guide plate and transmit drive power to the other rollers.
The top roller is housed in separate shaft housings (with ball bearings and diaphragm spring). The roller is pushed into the shaft housings.

The second roller from the top, aft is also housed in shaft housings. However, they have oblong mounting holes that allow positioning of the roller. This is used to adjust the tension of the transport belts.

3.13.6 Output Hopper

Scanned documents are deposited onto the output hopper plate in the order they were scanned. The output hopper plate automatically descends as the output stack height increases, due to the increasing weight of the paper. This methodology provides as falt an output path as possible, prevent thin documents from rolling up or turning over.

Depending on the type of documents a suitable adjustment can be made. An adjustment screw to trim for the average paperweight is found inside the scanner on the right hand side.
After lifting and pushing back the output hopper plate the knurled nut is loosened. For small or thin documents the screw is pushed upwards in the oblong hole and the knurled nut is tightened again.
In this top position only the two large springs are active, one at the left and right of the sidewall respectively.
Lowering the screw with the knurled nut activates the two smaller springs, one each at the left and right hand side, as well.

To prevent injury the transport motor is switched off as soon as the output hopper plate is lifted. This action is triggered by the newly installed microswitch on the left-hand side above the microswitch that stops the input hopper plate when single sheet feed is selected.

3.13.7 Drive Mechanism with Stepper Motor

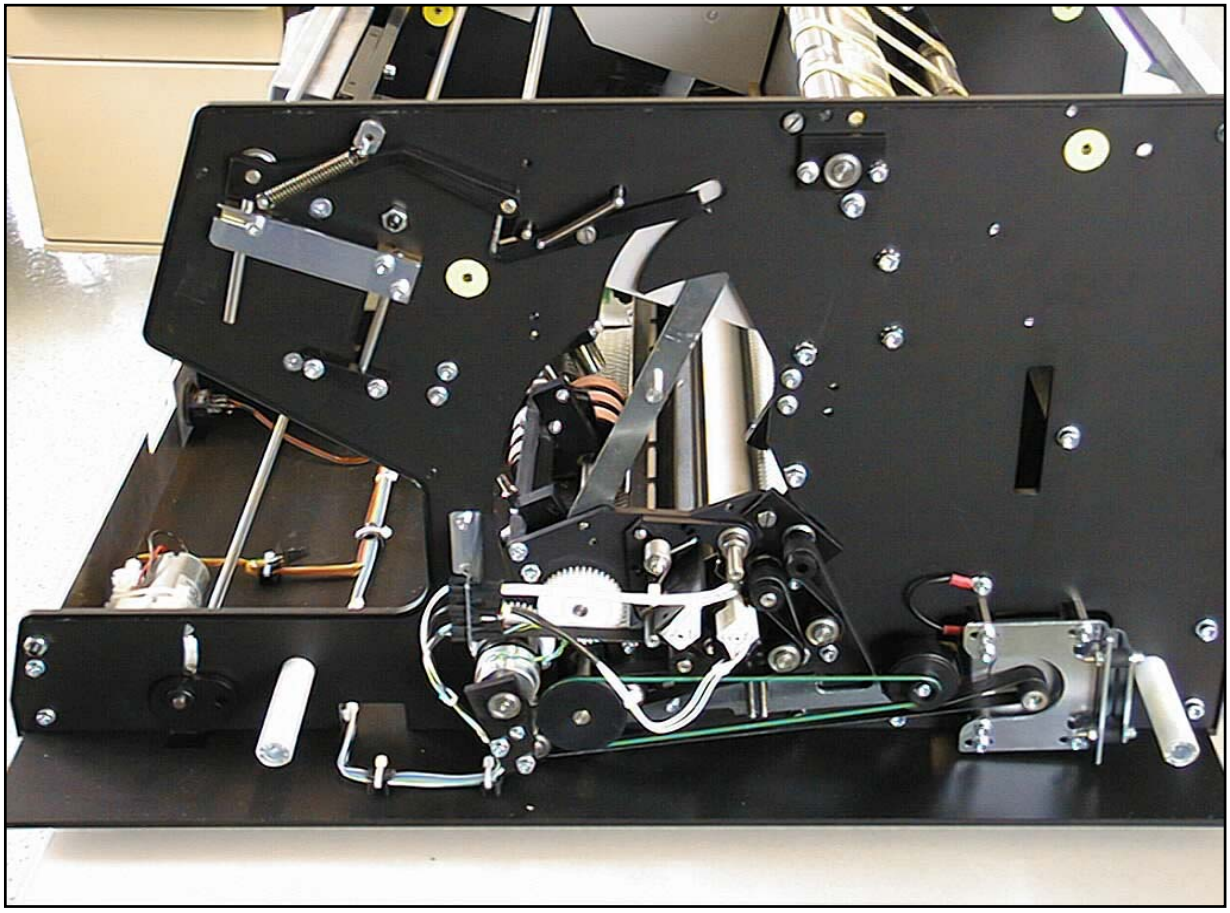
A stepper motor drives the total paper transport including the document feeder. Transport speed is adjusted to the resolution selected and is trimmed via a parameter.

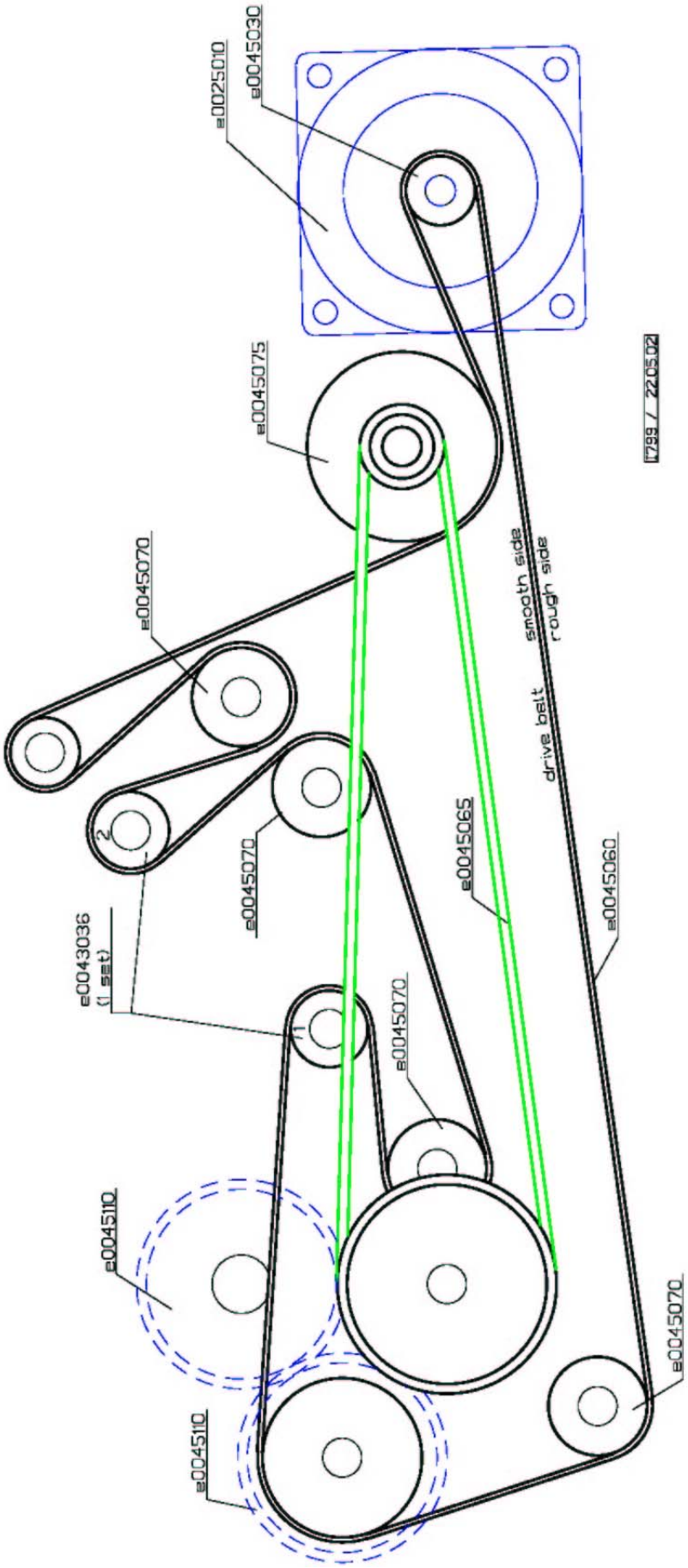
The drive system has the following components:
a stepper motor
a flat belt drive
a round belt
an electromagnetic clutch with gear

The stepper motor is mounted on the inside of the right hand side sidewall. Rubber elements are used to provide cushioning.
This aids in noise reduction.
When a scan command is issued the stepper motor starts. A flat woven belt transmits the drive power to the following parts:
- the first shaft of the paper return mechanism
- the two robber roller pairs
- the electromagnetic clutch that drives the initial feed rollers
- via a round belt to the push-back roller

Tension of the flat belt can be adjusted by moving the stepper motor. If tension is too loose the belt can slip, which can result in distortion of the scanned image or the scanner issuing an 'over length document' message.

The following illustration is a side view from the right showing the drive with the cover open.




ø0025010
ø0045030
ø0045075
ø0045070
ø0045070
ø0043036
(1 set)
ø0045065
ø0045060
ø0045070
ø0045110
ø0045110
ø0045070
drive belt
smooth side
rough side
799 / 22.05.02

3.14 Description of Scan Routine Flow

The scan routine is initiated by the PC via the scanner interface (DPU, HiScan or dunord) or via the inbuilt SCSI-Interface. Originally, of course, the operator and the user program issue the command.

First the scan status is tested. If, since the last scan process, a document has passed through the scanner unchecked the scanner issues a „Paper not scanned“ (E4) message. The „No Paper“ (E0) error message is issued if the paper sensor hasn't detected any paper or if the start switch has not been depressed.

If no error is present the stepper motor is started if it is not already running. The magnetic clutch is engaged and the feed belts pull in a document. If the ultrasound double feed detector senses a double feed before a document reaches the scan area (image window of the CCD) the motor is stopped and the error message „Doublefeed“ (E3) is issued.

The error message „Timeout“ (E1) is issued if the document does not reach the scan area within 7.5 seconds.

As soon as at least 256 pixels in a line have a grey level above the H-Gate threshold (default value is 100) the clutch is disengaged and the scan process proper starts. Image data are then received by the SCSI interface or scanner interface in the PC.

At the scan mode default setting (with length check) the selected number of lines (for example 2,400 lines for A4) will be transmitted.
When the number of lines, plus an offset of for example 50 lines, has been reached a check is made whether there is more paper in the scan area. If there is paper present for more than two seconds the motor is switched off and the error message „Paper jam“ (E5) is issued.
If paper is present for less than two seconds the condition is classed as "only" oversized, which can have several reasons. The error message „Oversize“ (E2) is issued in this case.

The length check can be turned off via the software. In that case only the number of lines appropriate for the document size are transmitted. A black line or stripe across the document can, in this mode, cause a scan end since the paper recognition only sees black. In this mode a „Paper jam“ is only recognised after 10 seconds have elapsed.

If the ultrasound double feed detector has responded during the scan process the error message "Doublefeed" (E3) is issued after scanning has ended.

If no error where detected during the scan process „Ready“ (8A) will be issued.